

TECHNICAL MANUAL

OPERATOR'S MANUAL

**MULTIPLE INTEGRATED LASER
ENGAGEMENT SYSTEM
(MILES 2000)**

**TACTICAL ENGAGEMENT SIMULATION SYSTEM
(TESS)**

FOR

**ARMORED PERSONNEL CARRIER
M113 (APC)**

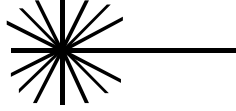
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27 MAY 2002



LASER WARNING

Suitable precautions must be taken to avoid possible damage to the eye from overexposure to radiated laser energy. Precautionary measures include the following:

- **NEVER fire the laser** at personnel within 10 meters.
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HOW TO USE THIS MANUAL

INTRODUCTION.

This manual contains operation instructions for the Multiple Integrated Laser Engagement System (MILES 2000), Tactical Engagement Simulation System (TESS), when configured on the M113 Armored Personnel Carrier (APC).

MANUAL DESCRIPTION.

This manual is divided into three chapters. Chapters are further divided into sections. The chapter descriptions are provided in the following subparagraphs.

Chapter 1 is an introduction that provides general information, equipment description and data, and theory of operation. It also contains a list of abbreviations and a glossary of terms.

Chapter 2 provides operating instructions for the MILES 2000 equipment.

Chapter 3 describes how to troubleshoot and maintain the equipment. MILES 2000 equipment does not need operator maintenance or lubrication, except for cleaning after use.

WARNING

NOTE: To operate the IWS, refer to TD 23-6920-703-10/TM 6920/07722B-10/13, IWS operator's manual.

NOTE: To operate the DIFCUE, refer to TD 9-6920-893-10/TM 6920-10/5, DIFCUE operator's manual.

NOTE: To operate the MGSS, refer to TD 9-6920-892-10/TM 6920/08953A-10/11.

- To prevent personal injury, turn all system power to the equipment off, including the CU, before conducting any removal/replacement procedures.
- Crew members must wear earplugs. Your hearing can be damaged by the Main Gun Signature Simulator (MGSS) and Direct/Indirect Fire Cue (DIFCUE) firing. All personnel within 26 meters of an armed MGSS or within 4 meters of an armed DIFCUE area must wear single hearing protection. [Keep ALL vehicle hatches closed when firing the Anti-Tank Weapons Effect Signature Simulator (ATWESS), MGSS or DIFCUE.]
- To preclude fragmentation hazards, personnel shall not be closer than 5 meters from an armed MGSS, 2 meters from an armed DIFCUE, and 90 meters from an armed ATWESS.
- A protective mask must be worn during exposure to DIFCUE colored smoke.
- Verify MGSS (M1A1/M1A2 only) or DIFCUE Firing Unit (if installed) is in the SAFE position before powering up the MILES 2000 System. Serious injury/death could occur.
- Ensure the weapon has the correct blank fire adapter and it is attached to the weapon correctly. Failure to install the blank adapter when firing blank ammunition could result in serious injury or death.
- Never touch the vehicle exhaust equipment when installing or removing MILES 2000 equipment. The exhaust can be very hot and cause severe burns.
- MILES equipment transit cases have a multiple personnel lifting requirement. Failure to use sufficient personnel could result in injury during installation or removal.

FIRE/EXPLOSION WARNING

- Personnel can be killed, burned, or otherwise injured if a pyrotechnic charge in an ATWESS, MGSS or DIFCUE accidentally ignites or explodes.
- **NO SMOKING, heat, or open flame**, within 50 feet of an ATWESS, MGSS or DIFCUE.
- A strong shock can set off an ATWESS, MGSS or DIFCUE pyrotechnic cartridge. Treat ATWESS, MGSS and DIFCUE cartridges as standard ammunition.
- Visually check the TOW to see if the firing pin is protruding. If it is, **DO NOT** install the ATWESS cartridge as serious personal injury may occur. Fill out the appropriate deficiency form, and return the weapon to the issue facility/authority. Sign out another weapon.
- Use safe/proper handling procedures when removing undetonated ATWESS cartridges or personal injury could occur. Dispose of undetonated cartridges in accordance with local SOP.
- ATWESS cartridges may expel fragments/debris. Maintain prescribed actual weapon danger/caution zones when using the ATWESS, or personal injury could occur.

FIRE/EXPLOSION WARNING continued

- Tape primer is toxic and highly flammable. Do not spray near heat, open flame, or sparks. Use primer only in well ventilated areas. Do not permit smoking in the area. Injury to personnel may result.

CAUTION

- Any batteries or otherwise hazardous materials replaced as routine maintenance should be disposed of through local government personnel.
- Ensure battery door is securely closed during storage and operations, or damage can occur to the battery door.
- Use care when starting capscrews not to cross threads. **DO NOT** use any tools to tighten capscrews until directed.
- When attaching connectors, ensure that the plugs and jacks are correctly connected. If misalignment occurs, damage to the pins may result causing BIT failure.
- Do not let MILES 2000 cables touch the vehicle exhaust or heating equipment. Heat can cause damage to cables and/or malfunction of the equipment.
- Do not spill fuel on detector belts or fastener tape. Fuel dissolves the adhesive properties of the tape primer and may cause a detector belt to fall from the vehicle, causing damage or loss of a detector belt.
- Blank fire can heat up the barrel and damage the cables if it touches the barrel.

For information on **FIRST AID**, refer to **FM 21-11/MCRP 3-02G**.

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CHAPTER 1 INTRODUCTION

SECTION I. GENERAL INFORMATION

1.1 SCOPE.

This manual describes how to install, operate, and maintain the Multiple Integrated Laser Engagement System (MILES 2000) Tactical Engagement Simulation System (TESS), when configured on the M113 Armored Personnel Carrier (APC). The manual also explains all authorized operator maintenance. Refer any maintenance problems not covered to organizational maintenance personnel.

1.2 MAINTENANCE FORMS AND RECORDS.

Department of the Army forms and procedures used for equipment maintenance will be those described by DA PAM 738-750, The Army Maintenance Management System (TAMMS).

1.3 REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIRs).

If your MILES 2000 equipment for the M113 System needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. Put it on a Quality Deficiency Report. Mail to us at Commander, Simulation, Training, and Instrumentation Command (STRICOM), ATTN: AMSTI-OPS-L 12350 Research Parkway, Orlando, FL 32826-3276. We'll send you a reply.

1.4 CORROSION PREVENTION AND CONTROL.

- a. Corrosion Prevention and Control (CPC) of Army material is a continuing concern. It is important that any corrosion problems with this item be reported, so that the problem can be corrected and improvements can be made to prevent the problem in the future.
- b. While corrosion is typically associated with rusting of metals, it can also include deterioration of other materials such as rubber and plastic. Unusual cracking, softening, swelling or breaking of these materials may be a corrosion problem.
- c. If a corrosion problem is identified, it can be reported using form SF-368. Use of key words such as "corrosion," "rust," "deterioration," or "cracking" will assure that the information is identified as a CPC problem.
- d. The form should be submitted to Commander, Simulation, Training, and Instrumentation Command (STRICOM), ATTN: AMSTI-OPS-L, 12350 Research Parkway, Orlando, FL 32826-3276.

1.5 PREPARATION FOR STORAGE OR SHIPMENT.

When receiving equipment for storage or shipment, always inspect the returned equipment for damage, breaks, cracks, and cleanliness.

1.6 LIST OF ABBREVIATIONS AND GLOSSARY.

Refer to Table 1-1 for the list of abbreviations used with the MILES 2000 System, and refer to Table 1-2 for the Glossary.

Table 1-1. List of Abbreviations.

AAV	Assault Amphibious Vehicle
AC-DC	Alternating Current/Direct Current
ASAAF	Automatic Small Arms Alignment Fixture
ATWESS	Anti-Tank Weapons Effects Signature Simulator
AVCPS	Audio Visual Cue Pyrotechnic Simulator
BFA	Blank Firing Adapter
BIT	Built-In-Test
CD/TDTD (Controller Gun)	Controller Device/Training Data Transfer Device
CDA	Control Display Assembly
CPC	Corrosion Prevention and Control
CSWS	Crew Served Weapon System
CU	Control Unit
CVC	Combat Vehicle Crew
CVS	Combat Vehicle System
DC-DC	Direct Current/Direct Current
DIFCUE	Direct/Indirect Fire Cue
DPCU	Data Processing Control Unit
EIR	Equipment Improvement Recommendation
EOD	Explosive Ordnance Disposal
FCU	Fire Control Unit
FlashWESS	Flash Weapons Effects Signature Simulator
FU	Firing Unit
ID	Identification
I/O	Input/Output
IR	Infrared
ISU	Integrated Sight Unit
ITS	Independent Target System
IWS	Individual Weapons System
IWS Console (DPCU)	Individual Weapons System Console (Data Processing Control Unit)

Table 1-1. List of Abbreviations - Continued.

KSI	Kill Status Indicator
LAV	Light Armored Vehicle
LASER	Light Amplification by Stimulated Emission of Radiation
LED	Light Emitting Diode
LTU	Laser Transmitter Unit
LU	Loader Unit
MARS	MILES After-Action Review System
MCS	Master Control Station
MG	Machine Gun
MGS	Missile Guidance System
MGSS	Main Gun Signature Simulator
MILES	Multiple Integrated Laser Engagement System
O/C	Observer Controller
OTPD	Optical Turret Positioning Device
PID	Player Identification
Pk	Probability of Kill
PMCS	Preventive Maintenance Checks and Services
PROM	Programmable Read-Only Memory
SAT	Small Arms Transmitter
SMAW	Shoulder-Mounted Assault Weapon
SWS	Surrogate Weapons System
TAMMS	The Army Maintenance Management System
TESS	Tactical Engagement Simulation System
TNB	Turret Network Box
TOW	Tube-Launched Optically-Tracked Wire-Guided Weapon System
ULT	Universal Laser Transmitter
Vac	Volts Alternating Current
Vdc	Volts Direct Current

Table 1-2. Glossary.

Administrative Kill	A kill assessed by a Controller for administrative purposes.
Automatic Small Arms Alignment Fixture (ASAAF)	Device used to align the Small Arms Transmitter (SAT) to the sights on a weapon.
Catastrophic Kill	A kill that totally disables a vehicle or individual.
Cheat Kill	A kill is assessed to a system when a tamper attempt has been detected.
Commo Kill	A kill that disables external communications.
Commo Override	Use the Control Unit USER INFO/ENTER push button to override the communications disable function under Communications/ Catastrophic Kill conditions in an emergency
Controller	An umpire or referee in a MILES 2000 training exercise.
Controller Device (CD/TDTD)	A device used by the Controller to upload, download and test the MILES 2000 system. (Controller Gun)
Direct/Indirect Fire Cue (DIFCUE)	A device that produces flash, noise, and smoke to simulate a vehicle being hit by direct or indirect fire.
Fastener Tape	A hook and pile type tape used to hold vehicle detector belts and other MILES 2000 equipment in place.
Firepower Kill	A kill that disables vehicle weapons.
Helmet Harness	The part of the IWS attached to the helmet or soft cover.
Hit	Simulated contact with incoming fire that does not result in a Kill.
Individual Weapons System (IWS)	The Helmet and Torso Harness assemblies and IWS Console (DPCU), which is worn by personnel. This equipment also includes the Small Arms Transmitter (SAT).
Kill	Refer to Catastrophic Kill, Commo Kill, Firepower Kill, or Mobility Kill
Kill Status Indicator (KSI)	A device attached to a vehicle that produces an external flashing light indicating a Hit, Near Miss or Kill.
LASER	Light Amplification by Stimulated Emission of Radiation. A narrow beam of light capable of transmitting information.
Laser Beam	In MILES 2000 equipment, an eye-safe, invisible beam of light that simulates weapons fire.
Laser Detector	A device that senses incoming laser beams.
Laser Transmitter	A device that transmits a laser beam.
Main Gun Signature Simulator (MGSS)	A device that produces a flash and bang to simulate main gun firing.
Mobility Kill	A kill that disables the vehicle movement. The crew has 20 seconds to bring the vehicle to a stop. If motion is sensed after the 20 seconds, a Cheat Kill will occur.
Near Miss	Laser fire close enough to be sensed by a laser detector, but not close enough to cause a Hit or Kill.

Table 1-2. Glossary - Continued.

Optical Turret Positioning Device (OTPD)	A device that provides an optical reference signal to the turret detector belts (on applicable vehicles) to determine the turret position with reference to the hull.
Reset	Brings the system to the ready (alive) condition. In a CVS, the reset brings the system to a ready condition and returns ammunition to the default levels.
Resurrect	When a CVS is resurrected, the system is brought to a ready condition, but the ammunition levels remain as they were when the system was killed.
Small Arms Transmitter (SAT)	A laser transmitter used on various individual and vehicle-mounted rifles and machine guns.
Torso Harness	The part of the IWS that is worn on the upper body.
Universal Laser Transmitter (ULT)	A laser transmitter used on various combat vehicle systems mounted on the main gun and the coax machine gun.
Weapon Token	Is embedded in software and allows the IWS Console (DPCU) to enable a SAT. The Weapon Token is transmitted to the IWS when the system is reset/resurrected by the CD/TDTD. The SAT cannot be enabled without a Weapon Token and will not have one in the following conditions: system is killed or another SAT is enabled with the same Torso Harness.

NOTE

Vehicle kits contain the SATs for the vehicle mounted weapons, but do not include IWS SATs.

1.7 SAFETY, CARE, AND HANDLING.

Before, during and after operation of equipment, read and adhere to all applicable WARNINGS and CAUTIONS. Perform all preventive maintenance checks and services as scheduled, and report any discrepancies as soon as possible. Use the proper tools and procedures for installation, troubleshooting, removal and replacement of components, and notify higher echelon maintenance personnel when warranted.

Although MILES 2000 consists of ruggedized equipment designed to withstand extreme vibration, shock, and environmental stresses. Treat the equipment with reasonable care. Do not use excessive force when handling, packing, or stowing equipment. Responsible handling and use will help prolong the life cycle and appearance of the equipment.

SECTION II. EQUIPMENT DESCRIPTION AND DATA

1.8 EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES.

1.8.1 Equipment Characteristics. The MILES 2000 M113 system permits the vehicle and crew to take part in realistic combat training exercises. Actual firing conditions of all vehicle weapons are simulated using laser beams. Blank ammunition and a Direct/Indirect Fire Cue (DIFCUE), if used on the M577, add to the system's realism.

Laser detectors mounted on the M113 vehicles and worn by crew members, sense incoming fire. The MILES 2000 system electronics determine the accuracy and simulated damage of incoming fire. The system also detects the type of weapon directing fire against the MILES 2000 equipped vehicle.

1.8.2 Equipment Capabilities and Features.

- a. Easily installed and removed.
- b. Simulates firing capabilities of the M2 machine gun.
- c. DIFCUE, if used, pyrotechnic charges add realism to weapon use.
- d. Detects all incoming fire, identifies incoming weapons and player ID (PID), and determines the effect of incoming fire on the using vehicle.
- e. Uses eye-safe laser transmitters.
- f. High visibility KSI strobe light signals vehicle Near Miss, Hit, or Kill.
- g. Compatible with all other MILES devices.

1.9 DESCRIPTION OF MAJOR COMPONENTS.

The MILES 2000 M113 system contains the following equipment:

- a. Individual Weapons System (IWS). The IWS portion (2 per system) of the M113 system consists of a Torso Harness, a Helmet Harness, and fastener tape to secure the Helmet Harness. The harness set has the following:
 - (1) Detectors - receive coded messages from laser transmitters.
 - (2) Amplifier - amplifies coded messages received from incoming laser transmitters and forwards them to the IWS Console (DPCU) for decoding.
 - (3) Infrared (IR) Transmitter - transmits information which links the Torso Harness and the weapon's Small Arms Transmitter (SAT).
 - (4) Audio Alarm - indicates the laser signal received.
 - (5) Helmet Inductive Loop - transfers information from the Helmet Harness detectors to the Torso Harness, IWS Console (DPCU) for processing. The Helmet Harness Amplifier is powered by an internal 3.6-volt lithium battery with a 3-year battery life.
 - (6) IWS Console (DPCU) - Data Processing Control Unit for the IWS - provides user interface and decodes the laser and IR transmitted data for the IWS.
 - (a) IWS Torso Harness PN 147421 is powered by a 9-volt battery with approximately 72 hours battery life.
 - (b) IWS Torso Harness PN 148245 is powered by an internal 36-volt lithium battery with approximately a 12-month battery life.

- b. M2 Small Arms Transmitter (SAT). Adaptation for the specific weapon is through a factory set laser power adjustment, modifying the encoded personality Programmable Read-Only Memory (PROM), and attaching the weapon specific mounting adapter. The laser power is factory adjusted to represent the specific weapon type and simulate its firing capabilities. A window for the infrared link transmitter and receiver, and a sunlight readable firing indicator is located in the rear cover. The SAT is powered by an internal 3.6-volt lithium battery with a 3-year battery life.
- c. Vehicle Detector Belts and Amplifier. Two (2) vehicle detector belts provide detection coverage for each aspect of the vehicle's vulnerability zones.
- d. Kill Status Indicator (KSI). The KSI is an integrated status indicator that provides information to an attacking vehicle. The KSI is composed of two (2) major functional elements: a visual strobe and the decoder/interface electronics. The KSI also includes the interface inputs for the DIFCUE trigger (if the DIFCUE is installed on the vehicle; the DIFCUE may only be installed on the M577 version), the serial bus interface and the optical I/O port. The optical I/O port provides the optical interface to the Controller Device/Training Data Transfer Device (CD/TDTD) for transfer of vehicle types/PK data uploading and events downloading. The KSI also includes a motion sensor to detect vehicle motion after a Mobility Kill to allow the Control Unit (CU) to assess a Cheat Kill if motion occurs after 20 seconds.
- e. Direct/Indirect Fire Cue (DIFCUE M577 ONLY), (if used). The optional DIFCUE consists of two (2) units: the Fire Control Unit (FCU) and the Firing Unit (FU). The DIFCUE simulates the vehicle receiving a direct/indirect hit from incoming rounds. It gives an audio (bang) and visual (smoke) indication when a vehicle is hit.
- f. Control Unit (CU). Contains all the primary user interface functions, displays and controls. Weapon selection, ammo selection (M1A1/M1A2/M2/M3 only), loading/reloading of ammunition, and weapon status are functions provided by the CU.
- g. Power Controller. The Power Controller assembly provides 24 Vdc, the charging voltage for the internal lead acid batteries, as well as power to the MILES 2000 system. The 24-volt battery is converted to 10.5 Vdc output by a DC-DC converter for use by the MILES 2000 kit, and provides backup power for more than 100 hours. The battery also supplies power to the KSI for a 10-minute time period, in the event the vehicles power is turned off and the vehicle is killed.

1.10 EQUIPMENT DATA.

Table 1-3 defines the equipment data.

Table 1-3. Equipment Data.

EQUIPMENT	WEIGHT (POUNDS)	DIMENSIONS L x W x D (INCHES)	OPERATING RANGE (METERS)
M2 Machine Gun (SAT)	0.4	1.3 x 1.0 x 2.8	1000
EQUIPMENT	WEIGHT (POUNDS)	DIMENSIONS L x W x D (INCHES)	NOTES
Right/Front Belt	3.2	236 x 2.0	
Left/Rear Belt	3.2	152 x 2.0	
IWS Helmet Harness	0.9	7.6 x 3.4 x 1.7	
IWS Torso Harness	3.3	24.0 x 7.6 x 1.7	
IWS Console (DPCU)	0.9	3.1 x 2.4 x 1.4	
Kill Status Indicator (KSI)	4.7	8.4 x 8.5 x 6.4	
Control Unit (CU)	1.0	4.2 x 5.4 x 2.2	
Power Controller	7.9	6.1 x 5.9 x 3.0	

SECTION III. THEORY OF OPERATION

1.11 BASIC PRINCIPLES OF OPERATION.

1.11.1 Principles of Operation (MILES 2000). The MILES 2000 system uses laser beams to simulate actual weapons fire. An eye-safe invisible laser beam is sent out by each weapon's transmitter when it is fired. The laser beam is coded, and simulates all of the weapon's capabilities including range, accuracy, and destructive capability.

Laser detector systems are used to sense incoming fire. The detector systems register incoming laser beams and determine whether they have scored a Near Miss, Hit, or Kill. Incoming fire can result in more than one type of a Hit or Kill. Types of hits or kills include Mobility, Communications, Firepower, or a Catastrophic Kill of the entire vehicle.

Table 1-4 defines the Kill Indication Chart.

1.11.2 Principles of Operation (M113 and M577). The M2 machine gun on the M113 is equipped with a laser transmitter that is fired using normal weapon operating procedures. The hull has detector belts attached that sense incoming fire. A Control Unit (CU) mounted inside determines the extent of incoming fire and its effect. The Kill Status Indicator (KSI) is activated by the CU when incoming fire is detected. (See Figure 1-1.)

1.11.2.1 Individual Weapons System (IWS). Each member of the crew of the M113 wears a Helmet Harness equipped with laser detectors; a Torso Harness equipped with laser detectors, an IWS Console (DPCU), and an audio alarm. When the detectors on the IWS system sense incoming fire, one of three things will happen:

- a. Alarm sounds briefly two times - a Near Miss occurred.
- b. Alarm sounds continuously - individual has been killed. If a SAT has been "Enabled," the alarm will sound continuously until that SAT has been located and "Disabled." If a SAT has not been "Enabled," the alarm will sound approximately 5-10 seconds.
- c. Alarm sounds briefly four times - the IWS has been reset by the controller.

1.11.2.2 Commander's M2 Machine Gun. The commander's M2 machine gun is fired using normal procedures. The gun is fitted with a Blank Fire Adapter (BFA) and loaded with blank ammunition. The sound/flash of blank fire is sensed by the M2 SAT mounted on the machine gun's cooling jacket. The laser transmitter will operate as long as blank ammunition is being fired. (The M2 SAT must be enabled by the commander's IWS.)

1.11.2.3 Detector Belt System. Two detector belts are mounted on the hull of the M113, which sense incoming fire. Each belt is electrically divided into two zones for a total of four zones, which represent the sides of the vehicle. They generate electrical signals that are fed to a decoder in the KSI.

1.11.2.4 Kill Status Indicator (KSI). Receives MILES messages from the detector belts, decodes them and then routes all valid messages to the Control Unit (CU). It has an optical port for external interface with the CD/TDTD, a motion sensor, and provides a trigger signal to the DIFCUE. It is mounted to provide 360° visibility of the flashing light. Refer to Table 1-4, Kill Indication Chart, for a list of the types of kills and the KSI indications.

1.11.2.5 Direct/Indirect Fire Cue (DIFCUE M577 ONLY). The DIFCUE consists of two (2) units: the Fire Control Unit (FCU) and the Firing Unit (FU). The DIFCUE simulates the vehicle receiving a direct/indirect Hit from incoming rounds. It gives an audio (bang) and visual (smoke) indication when a vehicle is Hit. The DIFCUE is mounted to a specified location depending on the vehicle configuration. When the MILES 2000 system detects incoming fire, the DIFCUE FU activates a pyrotechnic to simulate a Hit on the vehicle, then sends a signal to the Fire Control Unit (FCU) to decrease a round.

Table 1-4. Kill Indication Chart.

Type of Hit/Kill	Number of KSI Flashes	Audible Indication
Vehicle		
SMAW Spotting Rifle	1 Flash	None
Near Miss	2 Flashes	Near Miss.
Hit	4 Flashes	Hit.
Mobility Kill	4 Flashes	Hit, Mobility. Stop Vehicle. (The crew has 20 secs to bring the vehicle to a stop.)
Fire Power Kill	4 Flashes	Hit, Fire Power.
Communications Kill	4 Flashes	Hit, Commo Kill. (disables external communications only)
Catastrophic Kill	Flashes Continuously	Vehicle Kill
Administrative Kill	Flashes Continuously	Vehicle Kill
Cheat Kill	Flashes Continuously	Cheat Kill
Reset/Resurrect	1 Flash	Reset/Resurrect
IWS		
Near Miss	N/A	2 Beeps
Kill	N/A	Continuous
Administrative Kill	N/A	Continuous
Cheat Kill	N/A	Continuous
Reset/Resurrect	N/A	4 Beeps
<p>Notes: Cheat Kill will occur during a Mobility Kill if the vehicle does not stop within the allotted 20 seconds or moves after it has stopped. A Cheat Kill will occur when disconnecting any of the following pieces of vehicle equipment: KSI, any Detector Belt/Array, or Power Controller (must be reconnected for cheat to be indicated), or removing the battery on IWS Console (DPCU).</p> <p>In the event of a Catastrophic or Communications Kill, external communications can be over-ridden for EMERGENCIES ONLY by pressing the USER INFO push button on the Control Unit, selecting communication override and pressing the ENTER push button.</p>		

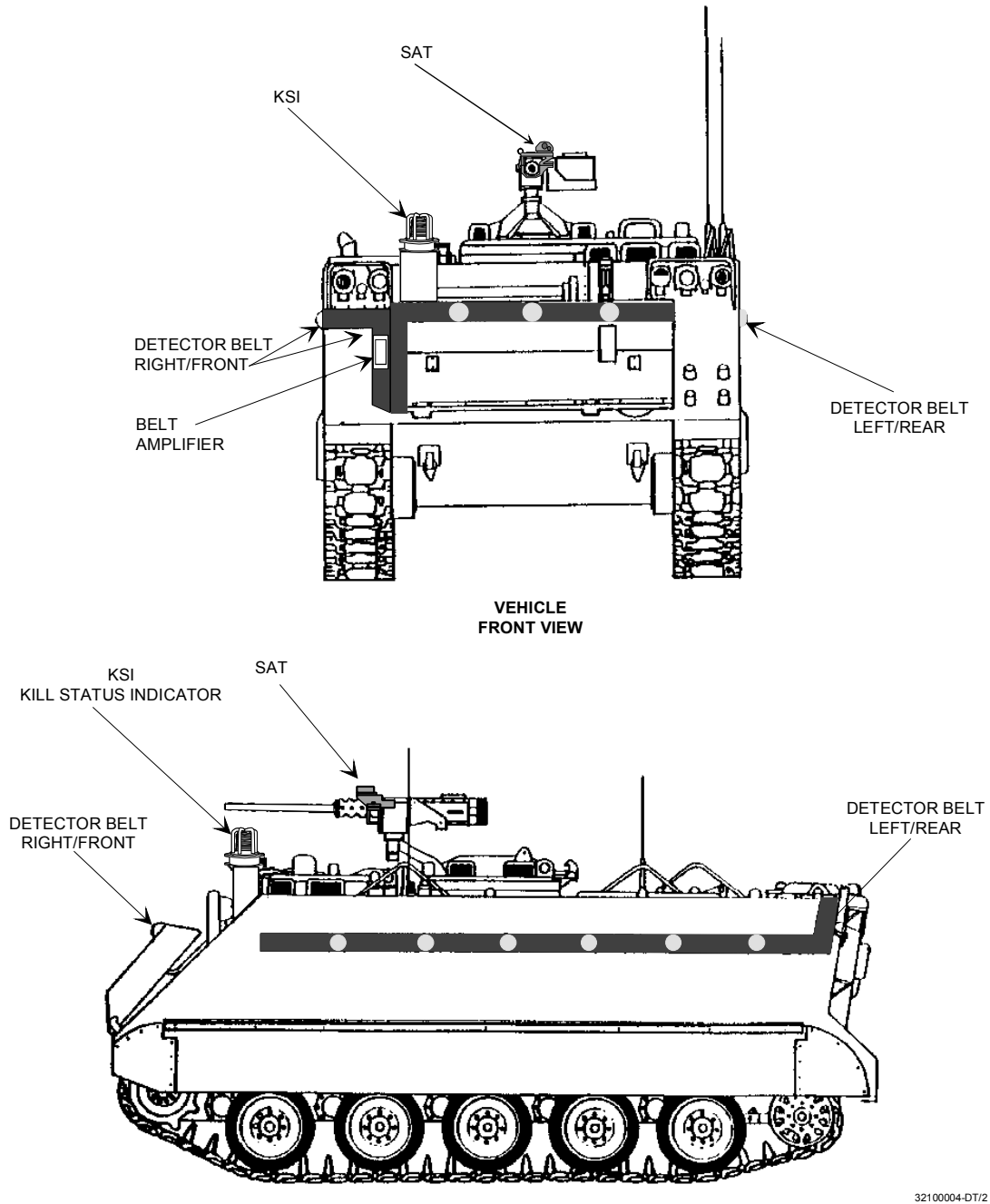


Figure 1-1. M113 Armored Personnel Carrier (APC).

1.11.2.6 Control Unit (CU). The CU provides the following: casualty assessment using Probability of Kill (Pk) tables, records/stores event data (500 events maximum), provides system real-time clock, monitors system for hardware failures and for cheat attempts, commands KSI to flash, and interrupts vehicle external communications during Communications/Catastrophic kills.

1.11.2.7 Power Controller. The Power Controller contains a rechargeable battery pack, and operates from the vehicle power to maintain the battery charge. It automatically switches to the internal battery to provide power when the vehicle power drops lower than the internal battery power, or when the vehicle power is removed from the MILES 2000 system.

Table 1-5 defines the Kit Equipment List.

Table 1-5. Kit Equipment List.

PACKAGE NOMENCLATURE: SIMULATION SYSTEM, CVS, M113 VEHICLE, VIC COMM SYSTEM				
PACKAGE PERTAINS TO: 146600-1				
PACKAGE CONTENTS				
QUANTITY	NAME OF ITEM	DWG NO.	PART NO.	NOTES
1	CONTROL UNIT ASSEMBLY	146402	146402-1	
1	POWER CONTROLLER ASSY	146409	146409-1	
1	DETECTOR BELT ASSY, RIGHT-FRONT, M113	146612	146612-1	
1	CABLE ASSY, INTERNAL/EXTERNAL M113, VIC	146604	146604-1	
2	DETECTOR ASSEMBLY, TORSO	147421	147421-1	
2	DETECTOR ASSEMBLY, HELMET	147422	147422-1	
1	TRANSIT CASE-CVS, M113	146601	146601-1	4
1	DETECTOR BELT ASSY, LEFT-REAR-M113	146610	146610-1	
1	ADAPTER ASSY, KSI-M113	146614	146614-1	
1	SAT ASSY, M2	147571	147571-5	
3	WEDGE ASSY, DETECTOR BELT	146435	146435-5	
1	GROMMET, PERISCOPE SEAL	146509	146509-7	
4	STRAP, BLK, 3/4" X 6"			1
4	STRAP, BLK, 3/4" X 8"			2
2	STRAP, BLK, 3/4" X 12"			3
AR	OPERATOR'S MANUAL		TD 9-6920-713-10	
NOTES: 1. MAY BE PURCHASED IN BULK QUANTITY AS PART OF VELCRO USA, CAGE CODE 11153, PART NO. 170790. THIS REEL CONSISTS OF 1200 STRAPS. 2. MAY BE PURCHASED IN BULK QUANTITY AS PART OF VELCRO USA, CAGE CODE 11153, PART NO. 170091. THIS REEL CONSISTS OF 900 STRAPS. 3. MAY BE PURCHASED IN BULK QUANTITY AS PART OF VELCRO USA, CAGE CODE 11153, PART NO. 170782. THIS REEL CONSISTS OF 600 STRAPS. 4. MARK THE TRANSIT CASE (2 PLACES) WITH THE APPLICABLE DASH NUMBER AFTER THE BASIC PART NUMBER. THE MARKING SHALL BE 6.35mm HIGH CHARACTERS MINIMUM, COLOR WHITE NO. 27925 IN ACCORDANCE WITH FED-STD-595. LOCATE AS SHOWN ON TRANSIT CASE DRAWING.				

See Figures 1-2 and 1-3 located at the end of this table.

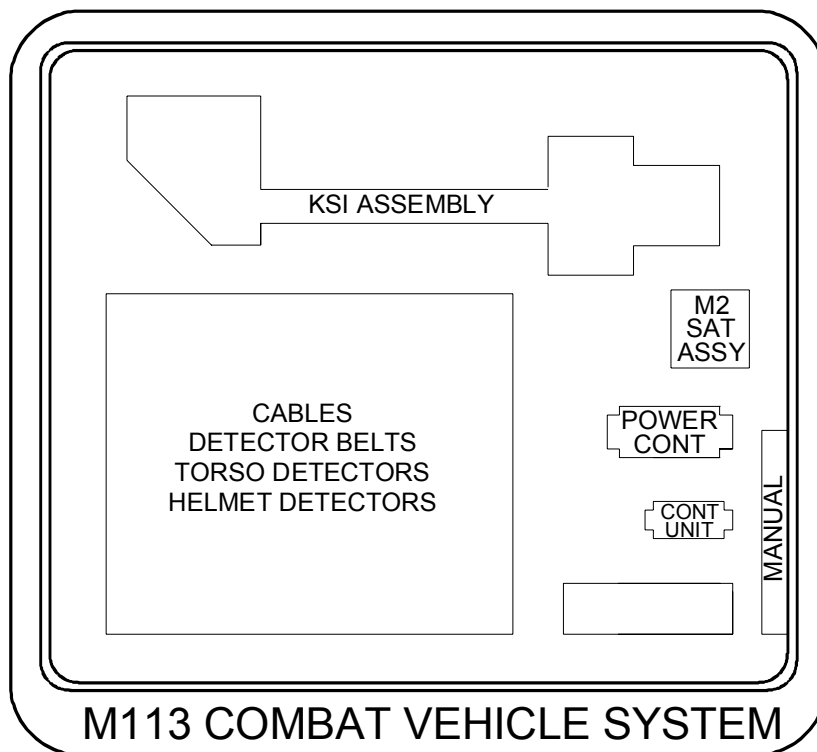
Table 1-5. Kit Equipment List -Continued.

PACKAGE NOMENCLATURE: SIMULATION SYSTEM, CVS, M113 VEHICLE, VIS COMM SYSTEM				
PACKAGE PERTAINS TO: 146600-2				
PACKAGE CONTENTS				
QUANTITY	NAME OF ITEM	DWG NO.	PART NO.	NOTES
1	CONTROL UNIT ASSEMBLY	146402	146402-1	
1	POWER CONTROLLER ASSY	146409	146409-2	
1	DETECTOR BELT ASSY, LEFT-REAR, M113	146610	146610-1	
1	DETECTOR BELT ASSY, RIGHT-FRONT, M113	146612	146612-1	
1	CABLE ASSY, INTERNAL/EXTERNAL M113, VIS	146506	146506-1	
2	DETECTOR ASSEMBLY, TORSO	148245	148245-1	
2	DETECTOR ASSEMBLY, HELMET	148246	148246-1	
1	TRANSIT CASE-CVS, M113	146601	146601-2	4
1	ADAPTER ASSY, KSI-M113	148340	148340-1	
1	SAT ASSY, M2	147571	147571-5	
3	WEDGE ASSY, DETECTOR BELT	146435	146435-1	
1	GROMMET, PERISCOPE SEAL	146509	146509-7	
4	STRAP, BLK, 3/4" X 6"			1
4	STRAP, BLK, 3/4" X 8"			2
2	STRAP, BLK, 3/4" X 12"			3
AR	OPERATOR'S MANUAL		TD 9-6920-713-10	
102	ANTISEIZE LUBRICANT, 102 TUBE		MIL-A-907	5

NOTES:

1. MAY BE PURCHASED IN BULK QUANTITY AS PART OF VELCRO USA, CAGE CODE 11153, PART NO. 170790. THIS REEL CONSISTS OF 1200 STRAPS.
2. MAY BE PURCHASED IN BULK QUANTITY AS PART OF VELCRO USA, CAGE CODE 11153, PART NO. 170091. THIS REEL CONSISTS OF 900 STRAPS.
3. MAY BE PURCHASED IN BULK QUANTITY AS PART OF VELCRO USA, CAGE CODE 11153, PART NO. 170782. THIS REEL CONSISTS OF 600 STRAPS.
4. MARK THE TRANSIT CASE (2 PLACES) WITH THE APPLICABLE DASH NUMBER AFTER THE BASIC PART NUMBER. THE MARKING SHALL BE 6.35mm HIGH CHARACTERS MINIMUM, COLOR WHITE NO. 27925 IN ACCORDANCE WITH FED-STD-595. LOCATE AS SHOWN ON TRANSIT CASE DRAWING.
5. ALTERNATES: ANTISEIZE LUBRICANT, PART NO. 51001, CAGE CODE 05972, IN 102 TUBE OR PART NO. 767, CAGE CODE 05972, OR PART NO. C5A, CAGE CODE 05972.

See Figures 1-2 and 1-3 located at the end of this table.



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Figure 1-2. M113 Combat Vehicle System Transit Case (Sheet 1 of 2).

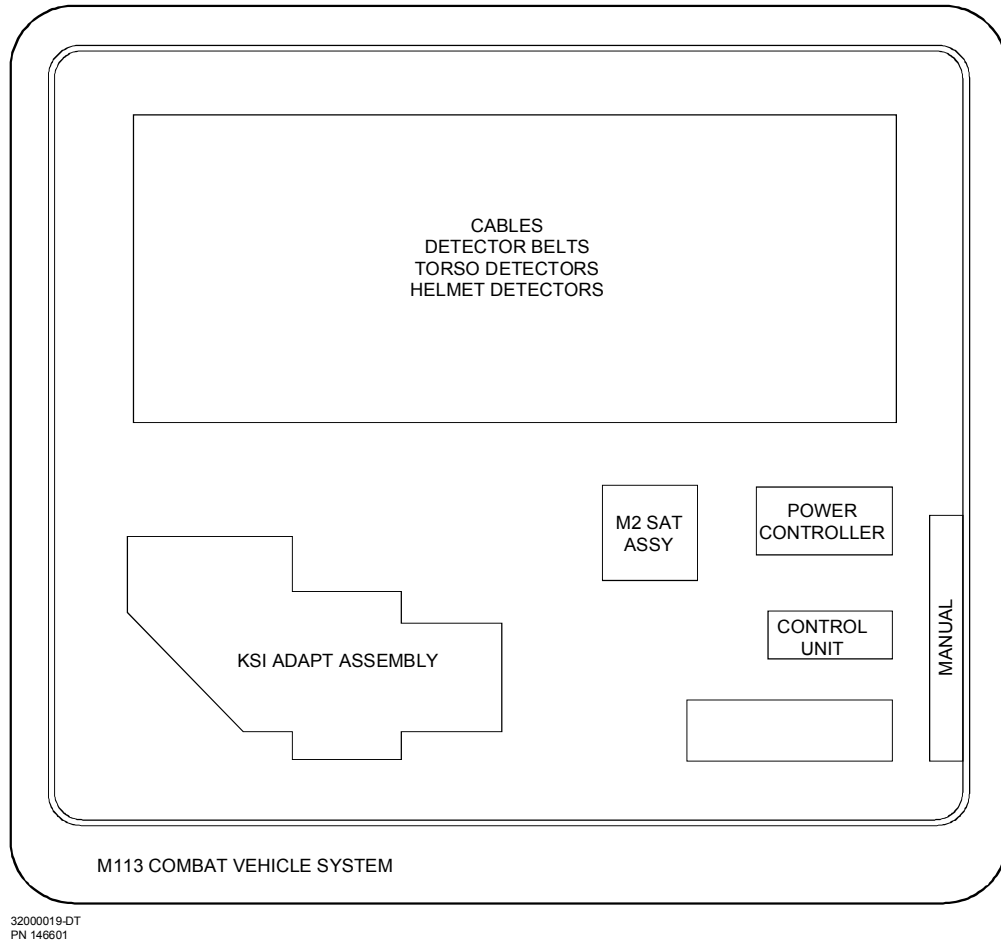


Figure 1-2. M113 Combat Vehicle System Transit Case (Sheet 2 of 2).

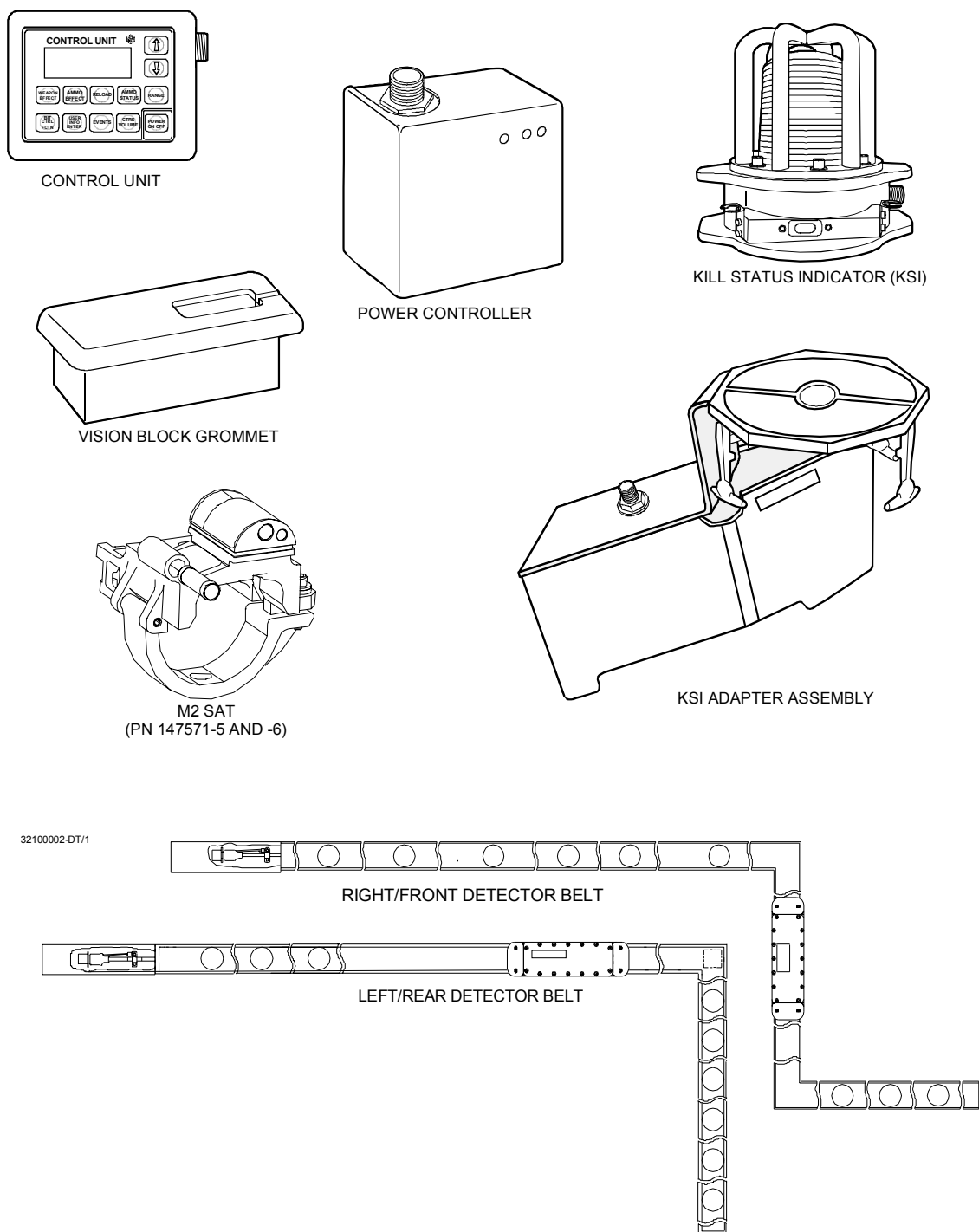
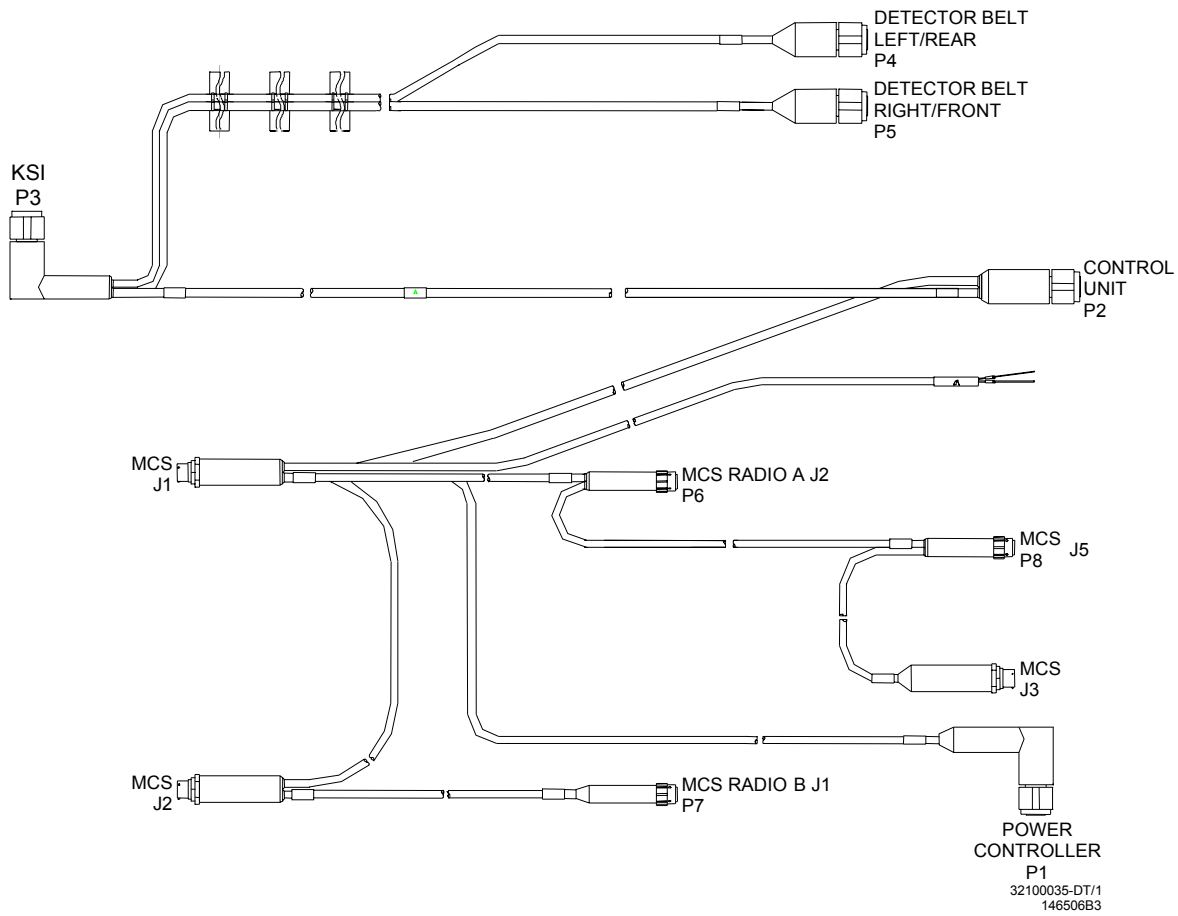
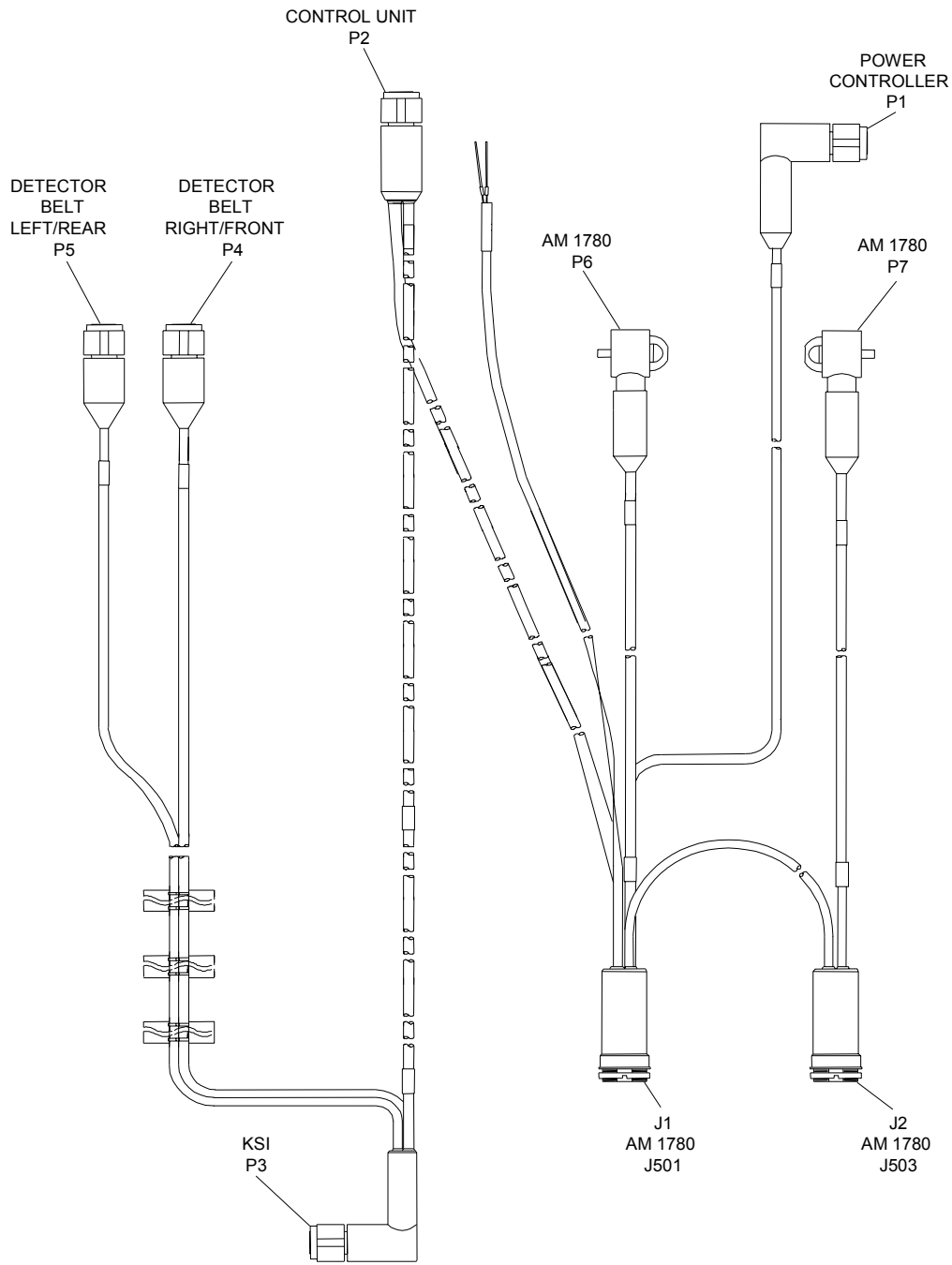


Figure 1-3. M113 CVS System Components (Sheet 1 of 3).



M113 VIS System Cable

Figure 1-3. M113 CVS System Components (Sheet 2 of 3).



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M113 VIC System Cable

Figure 1-3. M113 CVS System Components (Sheet 3 of 3).

CHAPTER 2 OPERATING INSTRUCTIONS

SECTION I. DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS

2.1 EQUIPMENT FIGURES AND TABLES.

The following figures as listed in Table 2-1 illustrate and describe the MILES 2000 M113 operating controls and indicators.

Table 2-1. Controls and Indicators Reference .

ITEM	FIGURE NO.
Individual Weapons System (IWS) (PN 147421-2)	2-1
Individual Weapons System (IWS) (PN 148245-1)	2-2
Small Arms Transmitter (SAT)	2-3
Detector Belts	2-4
Kill Status Indicator (KSI)	2-5
Control Unit (CU)	2-6
Power Controller	2-7

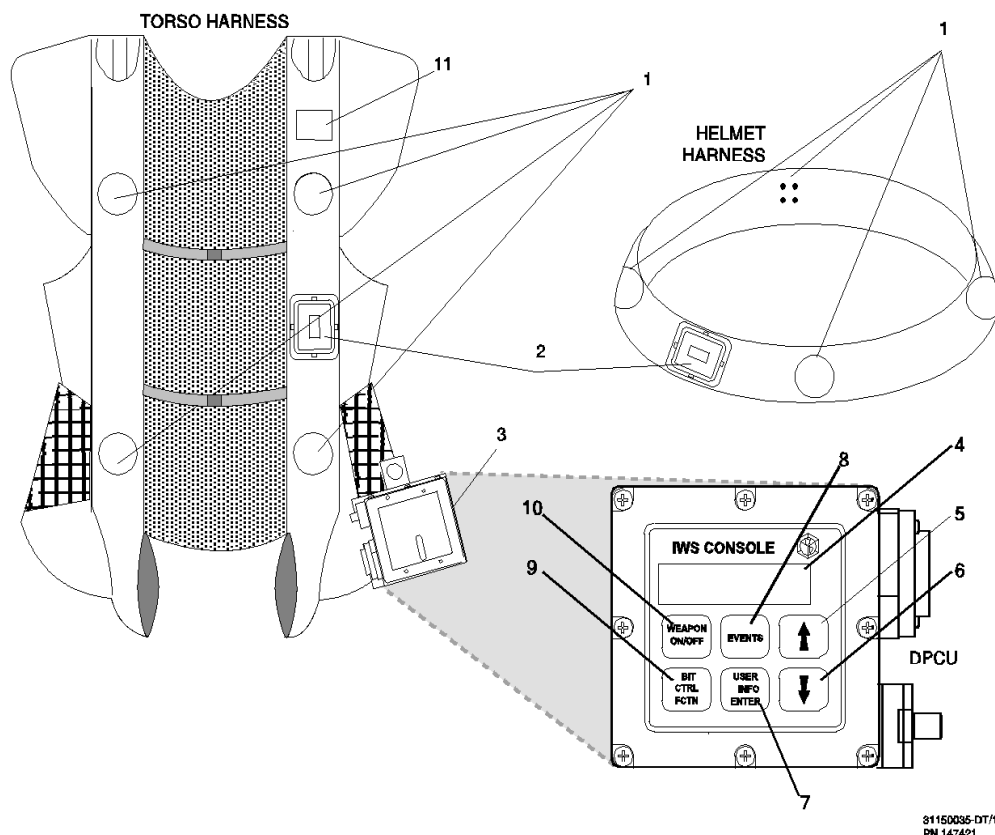


Figure 2-1. Individual Weapons System (IWS) (PN 147421-2).

1. DETECTORS. The laser detectors receive coded messages from incoming laser transmitters.
2. AMPLIFIER. Amplifies coded messages received from incoming laser transmitters and forwards them to the IWS Console (DPCU) for decoding.
3. IWS CONSOLE [DATA PROCESSING CONTROL UNIT (DPCU)]. Provides user interface, and decodes the laser and IR transmitted data for the IWS. Powered by 9-volt battery with approximately 72-hours battery life.
4. DISPLAY WINDOW. Displays system messages.
5. SCROLL UP PUSH BUTTON. Scrolls display up when pressed.
6. SCROLL DOWN PUSH BUTTON. Scrolls display down when pressed.
7. USER INFO/ENTER PUSH BUTTON. Displays user information on the display window, and provides enter function for information input.
8. EVENTS PUSH BUTTON. Recalls up to the 16 most recent events when pushed. Holds 500 events.
9. BIT/CTRL FCTN PUSH BUTTON. Executes BIT and provides various control functions to the user.
10. WEAPON ON/OFF PUSH BUTTON. Enables/disables the Small Arms Transmitter (SAT) via an infrared (IR) link when pressed.
11. INFRARED (IR) TRANSMITTER. IR communication link between the SAT and the IWS Console (DPCU). Transmits PID and ENABLE/DISABLE to SAT.

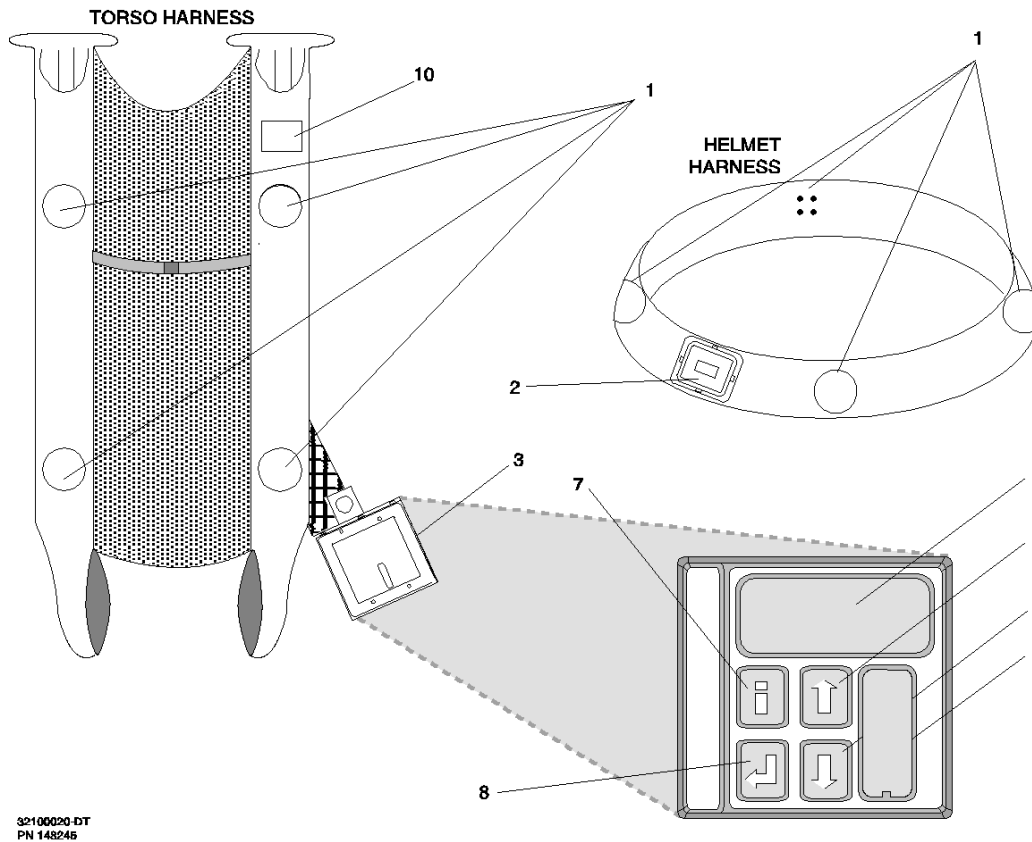


Figure 2-2. Individual Weapons System (IWS) (PN 148245-1).

1. DETECTORS. The laser detectors receive coded messages from incoming laser transmitters.
2. AMPLIFIER. Amplifies coded messages received from incoming laser transmitters, and forwards them to the IWS Console (DPCU) for decoding.
3. IWS CONSOLE [DATA PROCESSING CONTROL UNIT (DPCU)]. Provides user interface, and decodes the laser and IR transmitted data for the IWS. Powered by an internal 3.6-volt lithium battery with approximately a 12-month battery life.
4. DISPLAY WINDOW. Displays system messages.
5. SCROLL UP PUSH BUTTON. Toggles through menu displays and scrolls display up when pressed.
6. SCROLL DOWN PUSH BUTTON. Toggles through menu displays and scrolls display down when pressed.
7. ESCAPE PUSH BUTTON. Provides Escape functions.
8. ENTER PUSH BUTTON. Provides Enter function for information input.
9. OPTICAL PORT. Bidirectional IR communication link used by CD/TDTD for uploading and downloading data.
10. INFRARED (IR) TRANSMITTER. IR communication link between the SAT and the IWS Console (DPCU). Transmits PID and ENABLE/DISABLE to SAT.

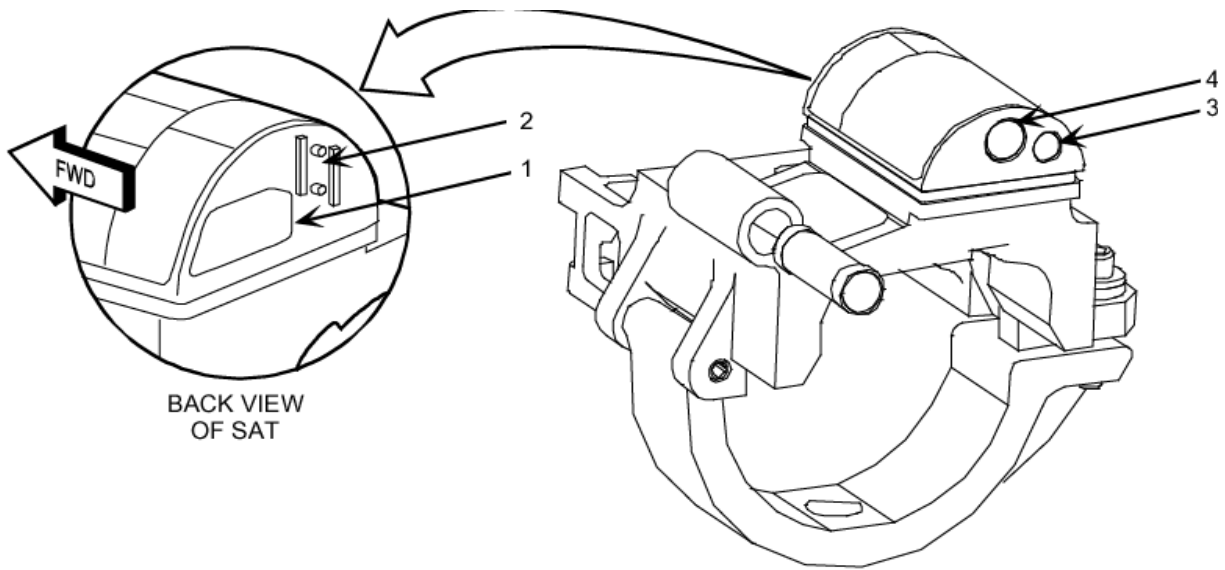
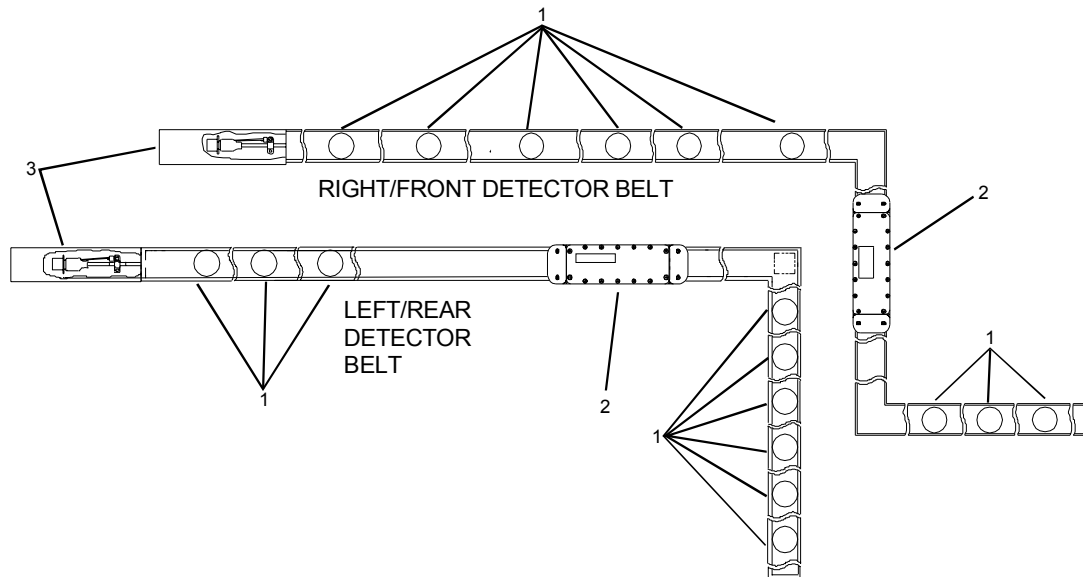


Figure 2-3. Small Arms Transmitter (SAT).

1. FIRING INDICATOR and IR TRANSMITTER/RECEIVER PORT. Firing indicator illuminates when the SAT is fired as a visual aide to the soldier. IR port provides a link between the weapon and the IWS.
2. ALIGNMENT SHAFTS. Used to adjust the laser alignment with the Automatic Small Arms Alignment Fixture (ASAAF).
3. BLANK SENSOR WINDOW. Allows light flash from blank firing of the weapon to be sensed so the SAT laser will be transmitted.
4. LASER OPTICAL WINDOW. Window through which the laser beam is transmitted.



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Figure 2-4. Detector Belts.

1. DETECTORS. Detect laser transmissions that are being fired at the vehicle.
2. AMPLIFIER. Amplifies coded laser signals that simulate incoming fire and forwards them to the KSI.
3. CONNECTOR. System Cable connector.

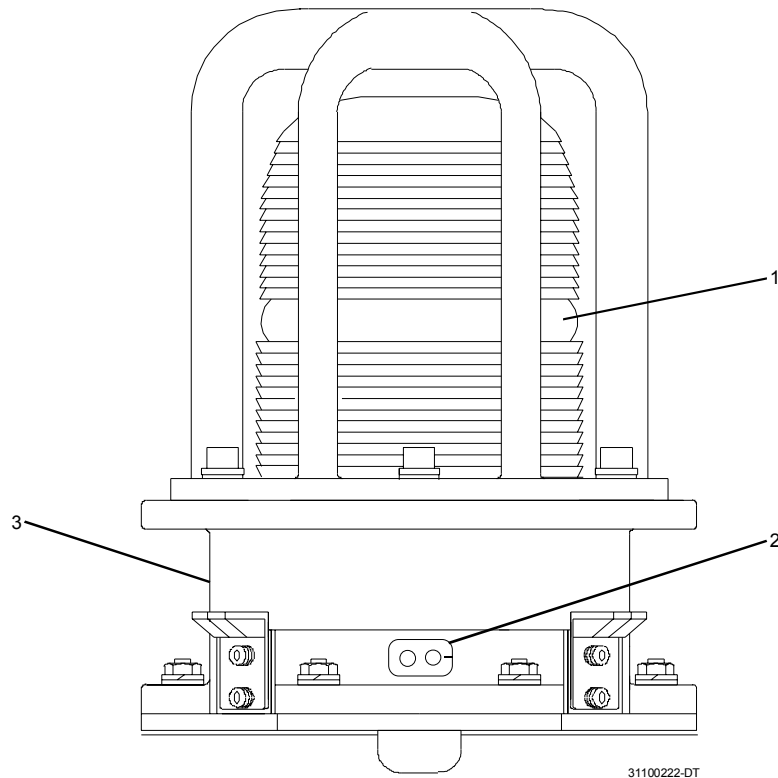
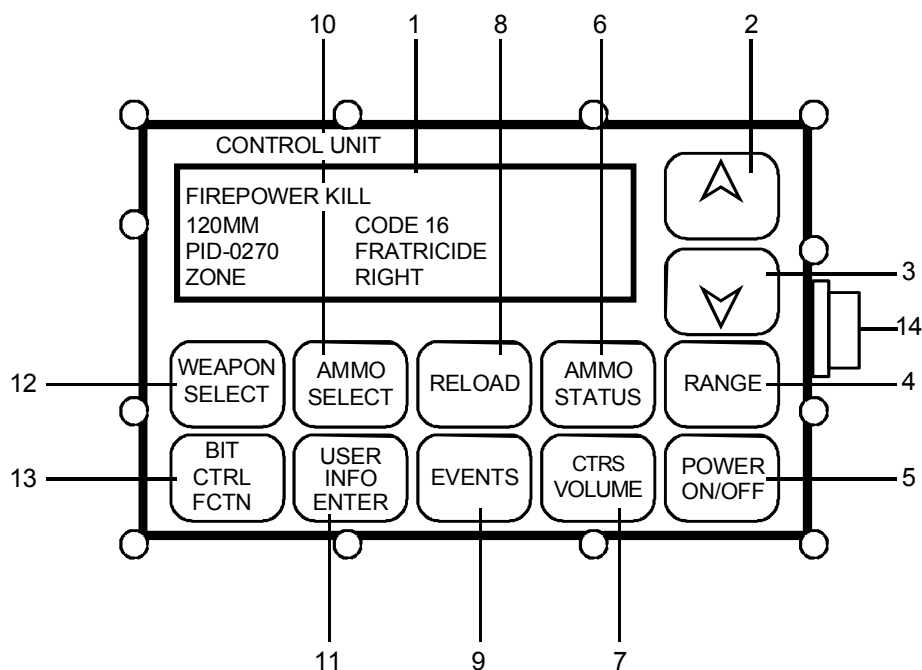


Figure 2-5. Kill Status Indicator (KSI).

1. **VISUAL STROBE.** Provides a 360E azimuth and 60E elevation optical output when a vehicle is hit (housed in an amber dome).
2. **OPTICAL PORT.** Bidirectional IR communications link used by CD/TDTD for uploading and downloading data.
3. **CONNECTOR (not shown).** System Cable connection.

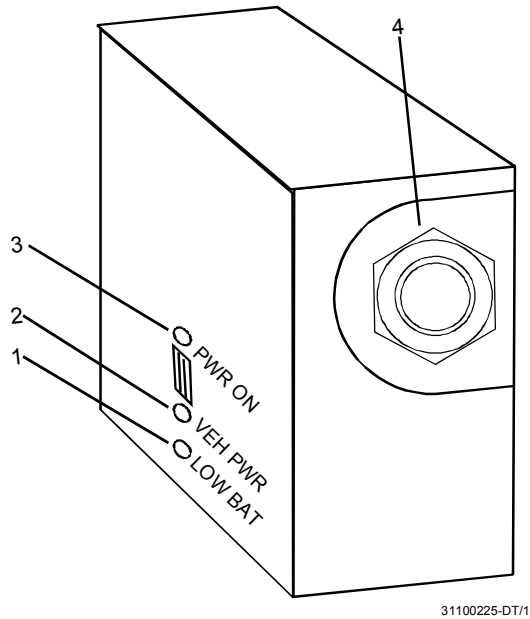


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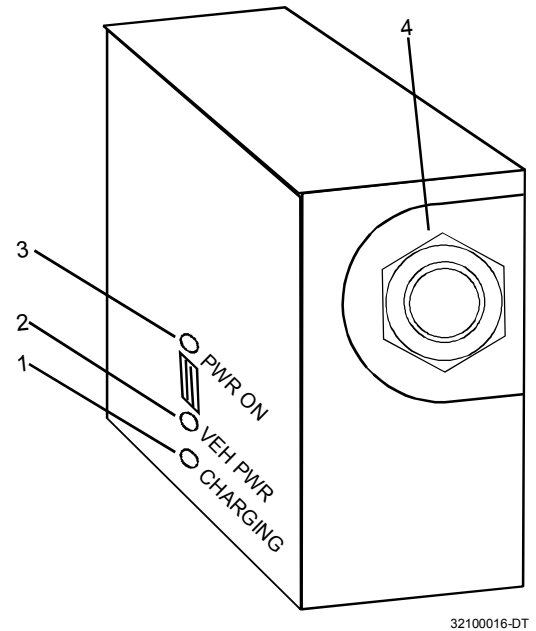
Figure 2-6. Control Unit (CU).

1. **DISPLAY WINDOW.** Displays events and system messages. (Example display shown.)
2. **SCROLL UP PUSH BUTTON.** Scrolls display up when pressed, and also moves the cursor.
3. **SCROLL DOWN PUSH BUTTON.** Scrolls display down when pressed, and also moves the cursor.
4. **RANGE PUSH BUTTON.** Allows the operator the option to input his estimate of target range (used ONLY on vehicles with TOWs).
5. **POWER ON/OFF.** Enables/disables the MILES 2000 System.
6. **AMMO STATUS PUSH BUTTON.** Displays number of rounds remaining for selected weapon.
7. **CTRS/VOLUME PUSH BUTTON.** CTRS allows user to adjust illumination of display. VOLUME allows user to adjust audio level to the vehicle headset.
8. **RELOAD PUSH BUTTON.** Causes the system to load any available selected ammunition shown in the display window.
9. **EVENTS PUSH BUTTON.** Allows the operator to review the 16 most recent events on the display window. Holds up to 500 events.
10. **AMMO SELECT PUSH BUTTON.** Allows the operator to view the different types of ammunition quantities.

11. **USER INFO/ENTER PUSH BUTTON.** Allows operator the ability to check his PID and vehicle type; override the communications disable function under Communications/Catastrophic Kill conditions in an emergency; and to enable/disable a DIFCUE or MGSS. ENTER allows controller to enter commands selected in Control Mode.
12. **WEAPON SELECT PUSH BUTTON.** Allows the operator the option to select the desired weapon to be used.
13. **BIT/CTRL FCTN PUSH BUTTON.** BIT executes a system BIT with the results shown in the display window. CTRL FCTN allows controller to select vehicle platform type, blank or dry fire coax activation, and FlashWESS or ATWESS activation, etc.
14. **CONNECTOR.** System Cable connection.



146409-1



146409-2

Figure 2-7. Power Controller.

1. LOW BATT INDICATOR (146409-1). LED blinks continuously to indicate low internal battery power. Illuminates when battery voltage drops to 21 ± 1 Vdc.
2. CHARGING INDICATOR (146409-2). Illuminates when battery voltage drops below 27.5 Vdc, and battery is charging.
3. VEHICLE POWER PRESENT INDICATOR. LED blinks continuously when vehicle power is at the CVS system, and the internal batteries are being trickle charged.
4. 10.5 VDC POWER PRESENT INDICATOR. LED blinks continuously when 10.5 Vdc power is ON.
5. CONNECTOR. System Cable connection.

SECTION II. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

Preventive Maintenance Checks and Services (PMCS) will ensure that the MILES 2000 equipment will be ready for operation and perform satisfactorily throughout its mission. Preventive maintenance checks consist of performing a systematic inspection to discover defects before they result in operational failure of the equipment. Defects or malfunctions discovered by the crew during use of the MILES 2000 equipment, or as a result of performing maintenance checks and services, will be reported using the proper forms.

2.2 INTRODUCTION TO PMCS TABLE.

Operator Preventive Maintenance Checks and Services (PMCS) are shown in Table 2-2. Tasks to be performed before operation are checked in the “B” column under the heading “Interval.” Tasks to be performed during operation are checked in the “D” column. Tasks to be performed after operation are checked in the “A” column. Tasks to be performed weekly are checked in the “W” column, with tasks to be performed monthly checked in the “M” column. If no check marks are in the monthly or weekly column, perform PMCS procedures daily.

NOTE

Within designated interval, these checks are to be performed in the order listed.

B - Before Operation
D - During Operation
A - After Operation

W - Weekly
M - Monthly

Table 2-2. Operator Preventive Maintenance Checks and Services .

ITEM NO.	ITEM TO BE INSPECTED	INTERVAL						PROCEDURES CHECK FOR AND HAVE REPAIRED	EQUIPMENT IS NOT READY/AVAILABLE IF:
		B	D	A	W	M			
1.	Individual Weapons System (IWS) Console (DPCU)	✓		✓				Inspect for cracks in display window and membrane switches.	Display window or membrane switch broken or cracked.
		✓	✓	✓				Check for display in display window when battery installed.	No display in display window.
		✓						Check for battery in unit (if applicable).	Battery not present (if applicable).
2.	IWS	✓		✓				Wipe all detectors clean. Inspect harness for damage that would prevent normal operation.	Detectors broken or missing. Amplifier cracked, broken, or missing.
3.	Small Arms Transmitter (SAT)	✓		✓				Inspect for dirty or damaged window. Clean window.	Window broken, cracked, or missing.
4.	Control Unit (CU)	✓		✓				Inspect for cracks in display window and membrane switches.	Display window or membrane switch broken.
		✓	✓	✓				Check for display in display window when powered on.	No display in display window when powered on.
5.	Kill Status Indicator (KSI)	✓		✓				Inspect for cracks in plastic lens (amber dome) of visual strobe.	Amber dome plastic lens cracked.
		✓		✓				Check for optical port damage.	Amber dome plastic lens broken, cracked or missing.
6.	Power Controller	✓		✓				Inspect for damaged connector.	Broken connector. Bent or missing pins.
		✓		✓				Inspect for acid leaks.	Acid is present.
7.	Detector Belts	✓		✓				Wipe all detectors/connectors clean. Inspect harnesses for damage that would prevent normal operation.	Detectors broken or missing. Connector pins dirty, bent or missing. Amplifier broken.
8.	Cable and Connector Assemblies	✓		✓				Inspect for broken or bare wires.	Broken or bare wires are present.
		✓		✓				Inspect connectors for damage or broken pins.	Broken connectors. Bent or missing pins.

SECTION III. OPERATION UNDER USUAL CONDITIONS

2.3 ASSEMBLY AND PREPARATION FOR USE.

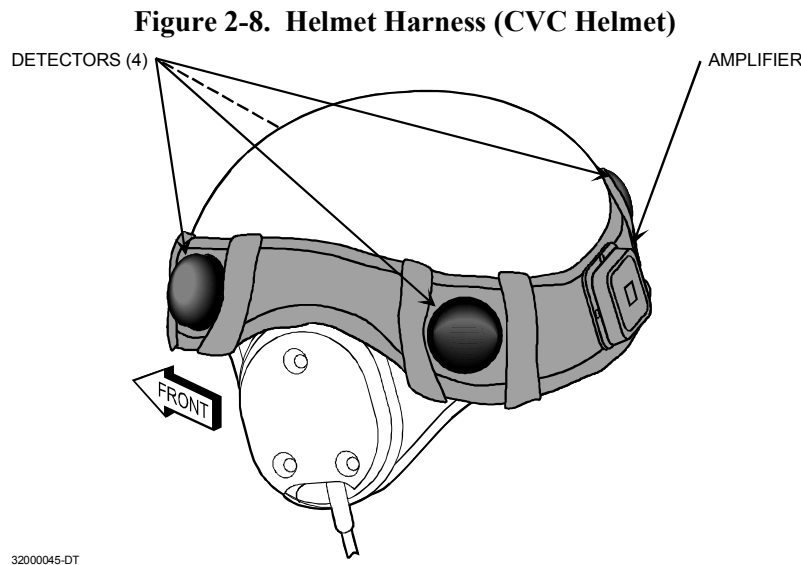
MILES 2000 equipment must be inspected and prepared as described in the following paragraphs prior to use.

NOTE

When applying fastener tape, always apply the “hook” type tape to the holding surface (the surface to which an item will be installed), and the “pile” type tape to the item being installed. For example, when installing the Control Unit (CU) in the M113, you would apply the hook tape to the front wall of the shelter at the commander’s station, and the pile tape to the CU. The CU can then be firmly attached to the side wall.

2.3.1 Individual Weapons System (IWS). The Individual Weapons System consists of the Torso Harness with IWS Console (DPCU), M2 Small Arms Transmitter (SAT), and the Helmet Harness.

2.3.1.1 Helmet Harness.



2.3.1.1.1 Helmet Harness Installation for CVC Helmet. (See Figure 2-8.)

- a. Remove the Helmet Harness from the Transit Case, and inspect the harness for damage.
- b. The Helmet Harness consists of a wide elasticized band with four (4) detectors, an amplifier, and eight (8) patches of fastener tape.
- c. Wipe all detectors clean. Replace and report damaged equipment, as required.
- d. Slip the Helmet Harness over the helmet with the amplifier to the rear of the helmet. Smooth out any wrinkles or twists. Ensure the harness fits snugly just above the helmet brim.

- e. Mark the helmet where the fastener tape patches touch the helmet. Remove the harness.

WARNING

Tape primer is toxic and highly flammable. Do not spray near heat, open flame, or sparks. Use primer only in well ventilated areas. Do not permit smoking in the area. Injury to personnel may result.

- f. Spray tape primer over the marked areas where the fastener tape will be attached. Let primer dry thoroughly (follow directions on the primer can), before applying tape.
- g. Cut three (3) strips of fastener tape approximately two (2) inches long. Remove the backing paper and press the tape patches firmly onto the helmet where the primer was applied.
- h. Place the Helmet Harness around the helmet.
- i. Adjust the harness so the three (3) patches of fastener tape line up with the three (3) pieces on the helmet. (Ensure that there are no wrinkles or twists in the harness.) Press the tape on the harness firmly against the tape on the helmet.

2.3.1.2 Torso Harness.

- a. Remove the Torso Harness from the transit case and inspect for damage.
- b. Wipe all detectors and the IWS Console (DPCU) clean.
- c. Replace and report damaged equipment, as required.
- d. Attach Torso Harness to pistol belt.
- e. For PN 147421, put vest on and fasten two (2) vest clips. (See Figure 2-9A.)
- f. For PN 148245, as you raise the harness, make sure the IWS Console (DPCU) is in the front. Then lower it over your head and fasten the vest clip. (See Figure 2-9B.)

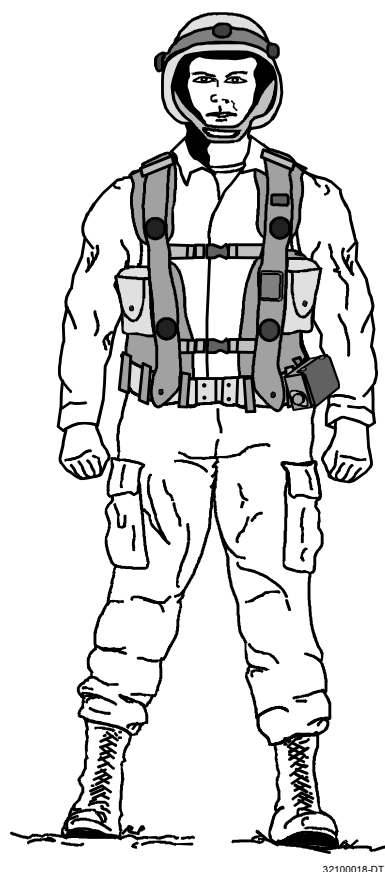
NOTE

Torso Harness PN 147421 requires a 9V-battery. Loosen the thumbscrew on the IWS Console (DPCU) and open the battery door. Insert the battery and secure the door using the thumbscrew. For Torso Harness PN 148245, the battery is located inside the IWS Console (DPCU).

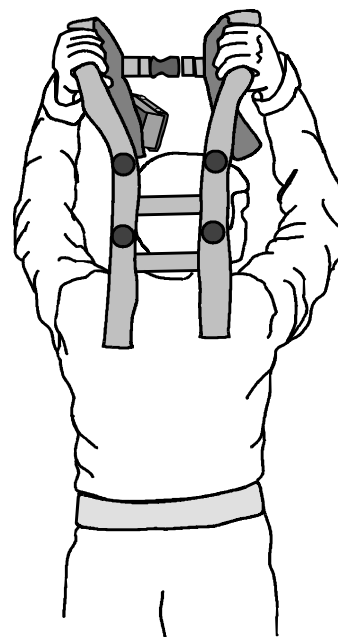
CAUTION

Ensure battery door is securely closed during storage and operations, or damage can occur to the battery door (PN 147421).

- g. To operate the IWS, refer to TD 23-6920-703-10/TM 6920/07722B-10/13, IWS Operator's Manual.



**PN 147421
A**



32000058-DT

**PN 148245
B**

Figure 2-9. Torso Harness Installation

2.3.2 Installation of MILES 2000 on M113 (M577). (See Figures 2-10 and 2-11.)

WARNING

To prevent personal injury, turn all system power off, including the CU, before conducting any removal/replacement procedures.

NOTE

Installation instructions for the Direct/Indirect Fire Cue (DIFCUE) are contained in TD 9-6920-893-10/TM 6920-10/5, if used on the M577.

Some vehicles may already have fastener tape applied. If so, proceed to installation instructions. Do not prime areas where there is already tape in good condition.

NOTE

MILES equipment installation procedures should be followed as outlined in the technical manual. If the following procedures CANNOT be followed due to cable length or additional vehicle equipment, then place the MILES equipment in the best and safest location.

2.3.2.1 M2 Small Arms Transmitter (SAT).

WARNING

Ensure the weapon has the correct blank fire adapter and it is attached to the weapon correctly. Failure to install the blank adapter when firing blank ammunition could result in serious injury or death.

NOTE

Inspect the front and rear windows of the SAT. Ensure that they are free from dirt and carbon buildup.

- a. Remove the SAT from the transit case. The SAT and clamp are one (1) unit. Make sure the SAT is clean and dry, and not cracked or broken.
- b. Inspect the Blank Sensor Window and the Laser Optical Window, making sure that they are not cracked, broken, or missing. Make sure the mounting clamp is operational.
- c. Inspect the IR Transmit/Receive Window making sure that it is not cracked, broken, or missing.
- d. Replace and report damaged equipment, as required.
- e. Slide the SAT over the barrel of the M2 and around the cooling jacket, butting up against the breech block. Tighten the SAT socket head capscrews equally until finger tight. (See Figure 2-10.)

CAUTION

Use care when starting capscrews not to cross threads. **DO NOT** use any tools to tighten capscrews until directed.

- f. Torque the SAT socket head capscrews to 85 inch-pounds, using the torque wrench supplied in the Automatic Small Arms Alignment Fixture (ASAAF) kit.
- g. Align the SAT using the ASAAF. Refer to TD 623-6920-705-10/TM 6920-10/2, ASAAF Operator's Manual.

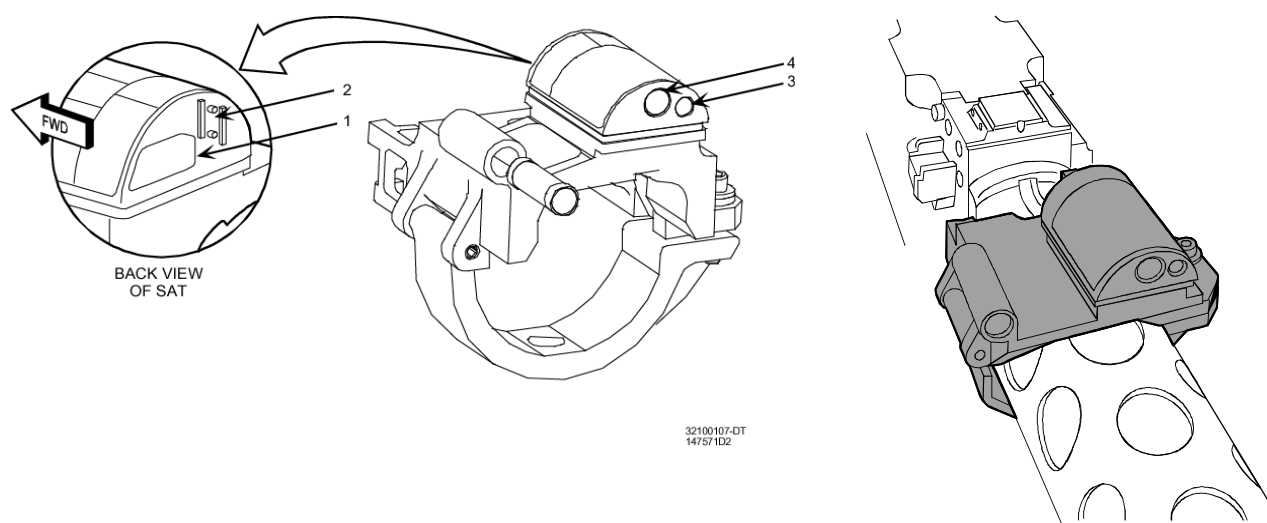


Figure 2-10. M2 Small Arms Transmitter (SAT).

1. FIRING INDICATOR AND IR TRANSMITTER/RECEIVER PORT.
2. ALIGNMENT SHAFTS. Used to adjust the laser alignment with the Automatic Small Arms Alignment Fixture (ASAAF).
3. BLANK SENSOR WINDOW.
4. LASER OPTICAL WINDOW

2.3.2.2 Detector Belt Fastener Tape. (See Figure 2-11.)

2.3.2.2.1 Applying Fastener Tape.

- a. Mark the vehicle for primer/fastener tape application along the areas where the belts will be routed. Those areas are described in the following paragraphs.
- b. The belt labeled "Right Front," without the system cable connector, starts just below the left halogen lamp continuing across the top of the trim vane. Fastener tape will be needed across the top of the trim vane, but not underneath the left halogen lights. (This will allow the trim vane to be extended without interference from the detector belt. See Figure 2-11, front view.) Route the belt to the right edge of the trim vane. There will be a 90E angle in the belt. The angled portion of the belt will be routed down the right side of the trim vane. Fastener tape will need to be affixed across the top of the trim vane and down the right side of the trim vane.
- c. The angled portion is approximately twice as long as the right side of the trim vane, and the fastener tape changes sides of the belt about halfway down the angled portion. The belt will be turned so that the fastener tape on the bottom half of the angled portion of the belt is facing toward the vehicle. Then the belt will be run up the side to the right of the trim vane, so the amplifier is next to the trim vane. Continue routing the belt under the right halogen lamp, around the right side with the system cable connector placed at the right rear corner.

NOTE

If using brush guards, apply two strips of hook fastener tape on each side of vehicle (left/right). One strip directly above the belt fastener tape and one strip directly below the belt fastener tape.

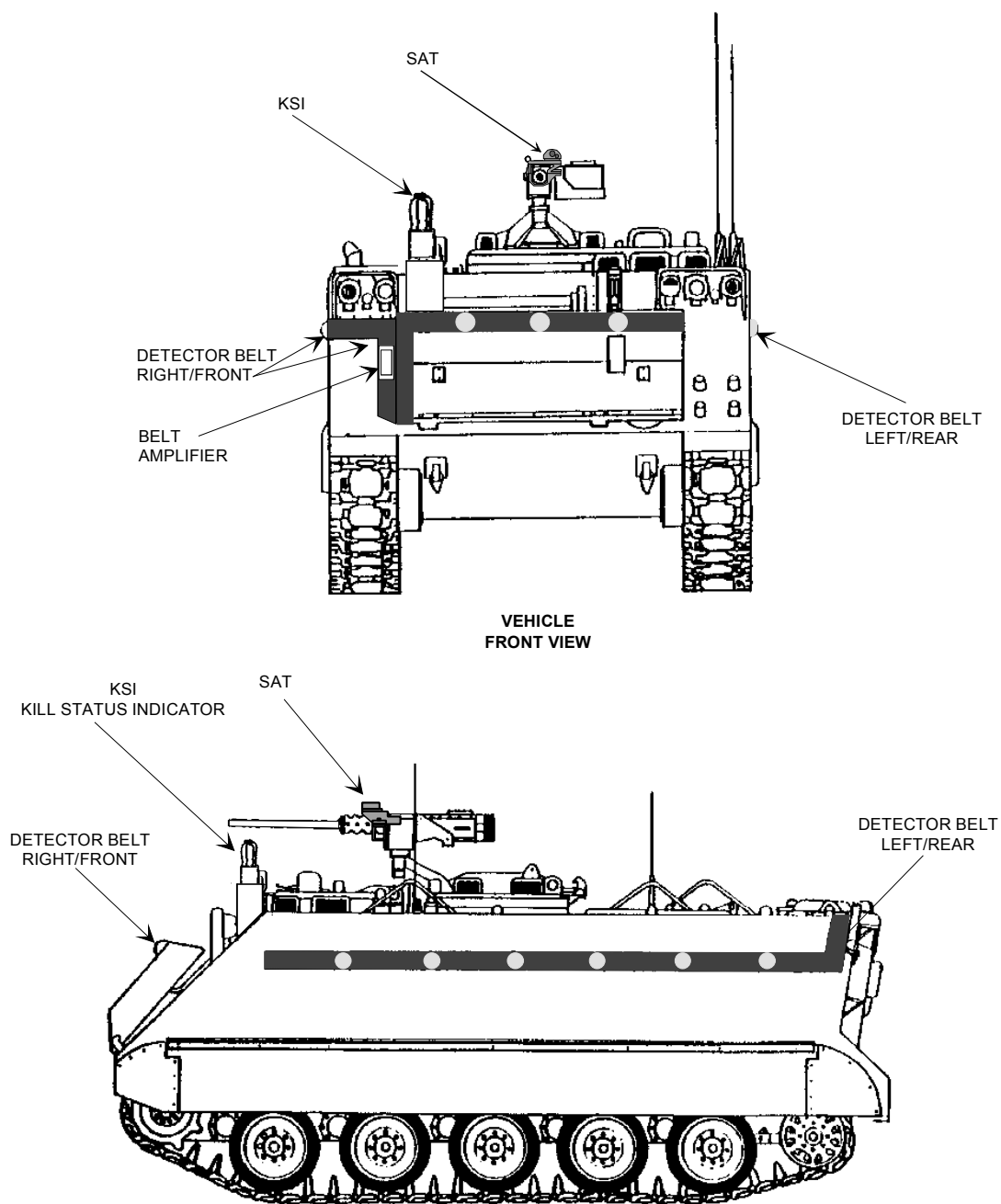


Figure 2-11. MILES 2000 Installation on M113.

- d. The belt labeled “Left/Front” starts at the left front corner and continues along the left side to the left rear side. Route the belt up to the top rear shelter edge and across to the right rear corner. (The system cable connector should be placed at the right rear corner.)
- e. Cut tape to the appropriate lengths as you need it for the following procedure.

2.3.2.2.2 Fastener Tape Preparation. Much of the MILES 2000 equipment is mounted with fastener tape. If fastener tape is not affixed to the vehicle already, or if existing tape is worn and/or unserviceable, remove any existing tape and use the following directions to apply/reapply the fastener tape:

- a. Clean all areas where fastener tape is to be installed with water, a brush, if necessary, and rags. Tape will not adhere to a dirty or oily surface.

WARNING

Tape primer is toxic and highly flammable. Do not spray near heat, open flame, or sparks. Use primer only in well ventilated areas. Do not permit smoking in the area. Injury to personnel may result.

- b. Spray a heavy coat of tape primer on the cleaned areas along the strip where the fastener tape will be applied. Allow primer to dry thoroughly (follow the directions on the primer can) before applying the fastener tape. (See Figure 2-12.)

NOTE

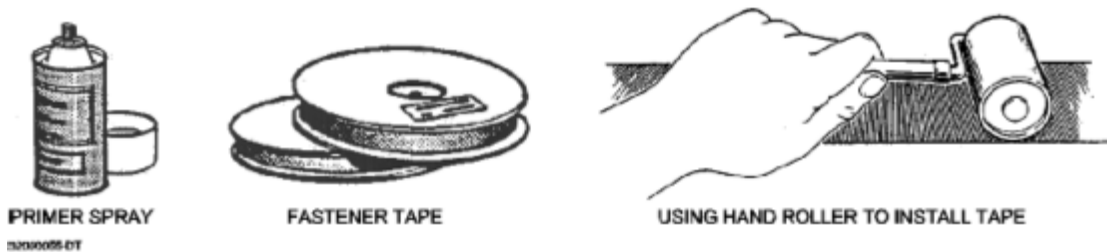


Figure 2-12. Fastener Tape Preparation.

The fastener tape has a protective backing. When applying short lengths of tape, remove all the backing before installing the tape. When applying longer lengths, remove the backing gradually as you apply the tape. This will help keep the tape adhesive from sticking to itself or to the wrong surface.

The quadrants of the vehicle-left, right, front, and rear are determined from the driver's viewpoint, which would be as facing towards the front of the vehicle. All installation instructions are given from this viewpoint, even though at times the installer may be facing to the rear of the vehicle.

NOTE

MILES equipment installation procedures should be followed as outlined in the technical manual. If the following procedures CANNOT be followed due to cable length or additional vehicle equipment, then place the MILES equipment in the best and safest location.

2.3.2.2.3 Fastener Tape (Right/Front). Apply fastener tape to match the outline of the detector belt placement. Ensure the tape does not buckle or crease. (See Figure 2-11.)

2.3.2.2.4 Fastener Tape (Left/Rear). Apply fastener tape to match the outline of the detector belt placement. Ensure the tape does not buckle or crease. (See Figure 2-11.)

2.3.2.3 Detector Belts.

- a. Remove detector belts from the transit case, and inspect belt segments for damage.
- b. Wipe all detectors clean.
- c. Inspect connector for dirt and/or damage.
- d. Replace and report damaged equipment, as required.

CAUTION

Do not spill fuel on detector belts or fastener tape. Fuel dissolves the adhesive properties of the tape primer, and may cause a detector belt to fall from the vehicle causing damage or loss of a detector belt.

- e. Working in short sections, press the detector belt labeled “Right/Front” along the fastener tape applied for that belt. Ensure that there are no buckles or creases in the belt. The connector for the system cable should be positioned at the right rear corner of the vehicle. (See Figure 2-11.)
- f. Working in short sections, press the detector belt labeled “Left/Rear” along the fastener tape applied for that belt. Ensure that there are no buckles or creases in the belt. The connector for the system cable should be positioned at the right rear corner of the vehicle.
- g. Using the fastener tape tie-wraps, secure the connector safely to the vehicle.

2.3.2.4 Kill Status Indicator (KSI).

- a. Remove the KSI and attached adapter assembly from the transit case.
- b. Inspect strobe assembly of the KSI for cracks.
- c. Inspect connector for dirt and/or damage
- d. Replace and report damaged equipment, as required.
- e. Remove the U-bolt from the adapter assembly, but keep it with you.
- f. Put one side of the U-bolt through the attachment bracket, so that the two (2) ends of the bolt are facing out away from the vehicle. Match up the mounting holes in the adapter with the two (2) ends of the U-bolt. Secure the U-bolt to the adapter with the nuts. (See Figure 2-13.)
- g. The KSI and adapter comes preassembled. If they are separated, refer to the following paragraphs.
- h. There should be fastener tape attached to the top of the adapter assembly, as well as to the bottom of the KSI. If this is not the case, apply two (2) large strips of pile fastener tape to the bottom of the KSI (ensuring the center bolt is not obstructed), and two (2) large strips of hook fastener tape to the top of the adapter assembly (ensuring the mounting hole is not obstructed).

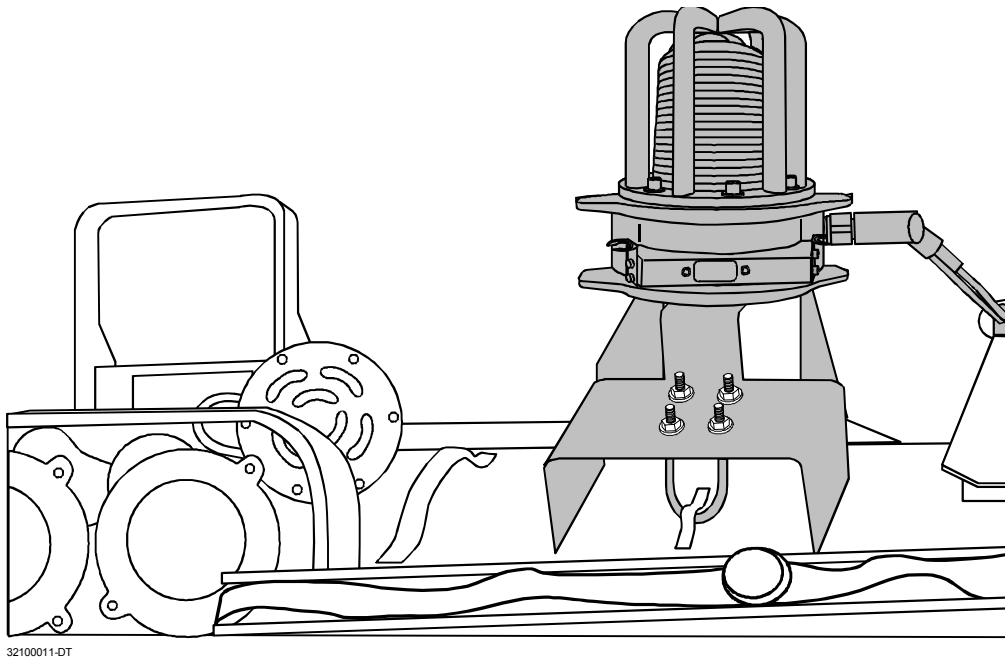


Figure 2-13. M113 KSI and Adapter Placement.

NOTE

For the following step, make sure that the KSI and the adapter are lined up as described before placing them together, as the fastener tape will make it difficult to separate the units to realign them.

- i. After matching the center bolt with the mounting hole, making sure that the four (4) rubber latches on the adapter assembly are in line with the four (4) latching brackets on the KSI, place the KSI securely on the adapter.
- j. Pull each rubber latch up and fasten it to its latching bracket.

2.3.2.5 Direct/Indirect Fire Cue (DIFCUE) (M577 ONLY). Install the DIFCUE, if used, per the installation instructions in TD 9-6920-893-10/TM 6920-10/5.

2.3.2.6 System Cable (Exterior ONLY).

WARNING

To prevent personal injury, turn all system power off, including the CU, before conducting any removal/replacement procedures.

- a. Inspect the entire length of the cable, making sure there are no bare wires exposed, and that the cable has not been damaged in any way.
- b. Inspect connectors for dirt and/or damage.
- c. Replace and report damaged equipment, as required.
- d. Lay out the cable on top of the vehicle. Stretch it out and look for the segments labeled KSI, Right/Front, and Left/Rear. Group these segments together. (See Figure 2-14.)

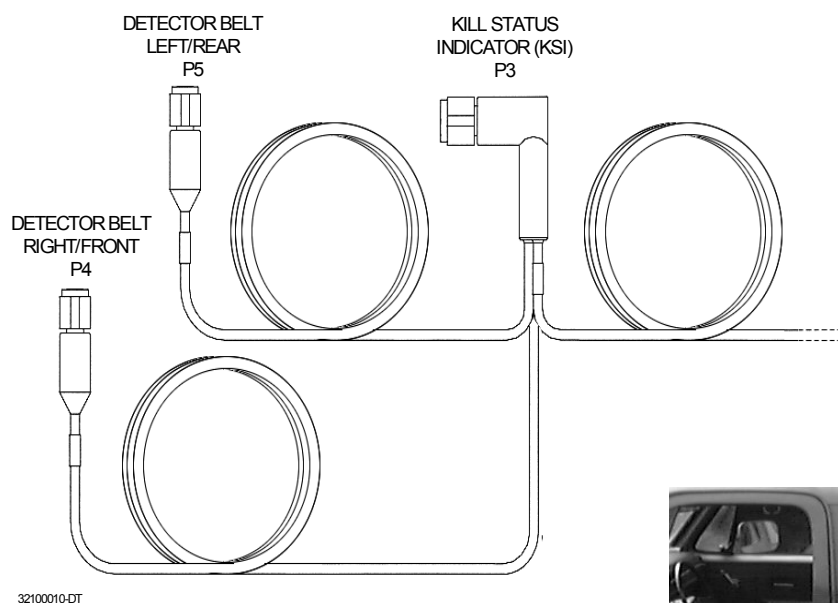


Figure 2-14. System Cable, External Connections.

- e. Pass the remaining segments into the vehicle. Route the KSI and detector segments through the driver's 9 o'clock vision block to the outside of the vehicle, and into the periscope block grommet.
- f. Once the cable segments are inside, install the periscope block grommet by pushing firmly and ensuring a snug fit.

NOTE

Route the cables and connect them to the individual units. Using fastener tape tie-wraps at intervals, secure the cables safely out of the way.

Letter/number designators are shown in parenthesis. For example: (P3) or (J1). The designators have been added to clarify connector identifications. Each system cable segment is labeled with its unique designator, as well as with the name of the unit to which the segment should be connected.

Cable segments are labeled with "P" (plug) and "J" (jack) designators as shown in the following example: "P1/J2," where P1 indicates that the connector of that cable segment is plug #1; and J2 indicates the routing destination, jack #2, of the equipment/cable to which the cable segment is being routed. The installation instructions of this manual identify the equipment/cable to which each cable segment is to be routed.

- g. Route segment (P3-green sleeve) to the KSI, and attach (P3) to (J1).
- h. Route the detector belt cables to the right rear corner of the vehicle. Attach the connector labeled Left/Rear (P5-gray sleeve) to the Left/Rear Detector Belt (J1), and the cable labeled Right/Front (P4 - white sleeve) to the Right/Front Detector Belt (J1).
- i. Secure all cables out of the way with fastener tape or fastener tape tie-wraps.

2.3.2.7 Control Unit (CU).

- a. Remove the CU from the transit case, and inspect for cracks or broken display window and membrane switches.
- b. Inspect connector for dirt and/or damage.
- c. Replace and report **damaged** equipment, as required.
- d. There should be strips of fastener tape covering the back of the unit. If these are not present, apply them using the same method used to apply fastener tape to the vehicle. Attach fastener tape to the front wall of the shelter at the commander's station. The CU location may have to be shifted to the right of the J-Box if the J-Box is present. Mount the CU to the front wall and ensure that it is firmly seated. (See Figure 2-15, sheet 1 of 3) Routing of the CU cables are depicted in the Figure 2-15, sheet 2 of 3 and Figure 2-15, sheet 3 of 3)



Figure 2-15, Sheet 1 of 3.



Figure 2-15, Sheet 2 of 3.



Figure 2-15, Sheet 3 of 3. M113 Control Unit Mounting.

2.3.2.8 Power Controller.

- a. Remove the Power Controller from the transit case and inspect for damage.
- b. Inspect connector for dirt and/or damage.
- c. Replace and report damaged equipment, as required.
- d. On the bottom of the box are two (2) strips of fastener tape. If these strips are not present, apply them using the same method used to apply fastener tape to the vehicle.
- e. Attach fastener tape to the shelf below or near the Master Control Station or AM-1780 amplifier. Mount the Power Controller to the shelf ensuring that it is firmly seated and that the LEDs are in plain view of the crew. (See Figure 2-16.)



Figure 2-16. M113 Power Controller Mounting.

2.3.2.9 System Cable (Interior ONLY).

WARNING

To prevent personal injury, turn all system power off, including the CU, before conducting any removal/replacement procedures.

2.3.2.9.1 M113 VIC ONLY System Cable. (See Figure 2-17.)

- a. Route segment (P6) and segment (J1) to the AM-1780 amplifier, disconnect the cable connected to (J501). Connect (P6) to the (J501) connector on the amplifier. Connect (J1) to the removed cable connector.
- b. Route segment (P7) and segment (J2) to the AM-1780 amplifier, disconnect the cable connected to (J503). Connect (P7) to the (J503) connector on the amplifier. Connect (J2) to the removed cable connector.
- c. There will be two (2) insulated wires, stripped at the ends and tinned, attached to the system cable near the segments connected to the amplifier. Connect the tinned part of the (-) wire to the Audio binding post on the AM-1780. Connect the tinned part of the (+) wire to the other Audio binding post on the AM-1780 (See Figures 2-18 and 2-19.)
- d. Route segment (P2-red sleeve) to the CU and connect (P2) to (J1) of the CU. (See Figure 2-20.)
- e. Route segment (P1-violet sleeve) to the Power Controller, and connect (P1) to (J1) of the Power Controller. (See Figure 2-21.)

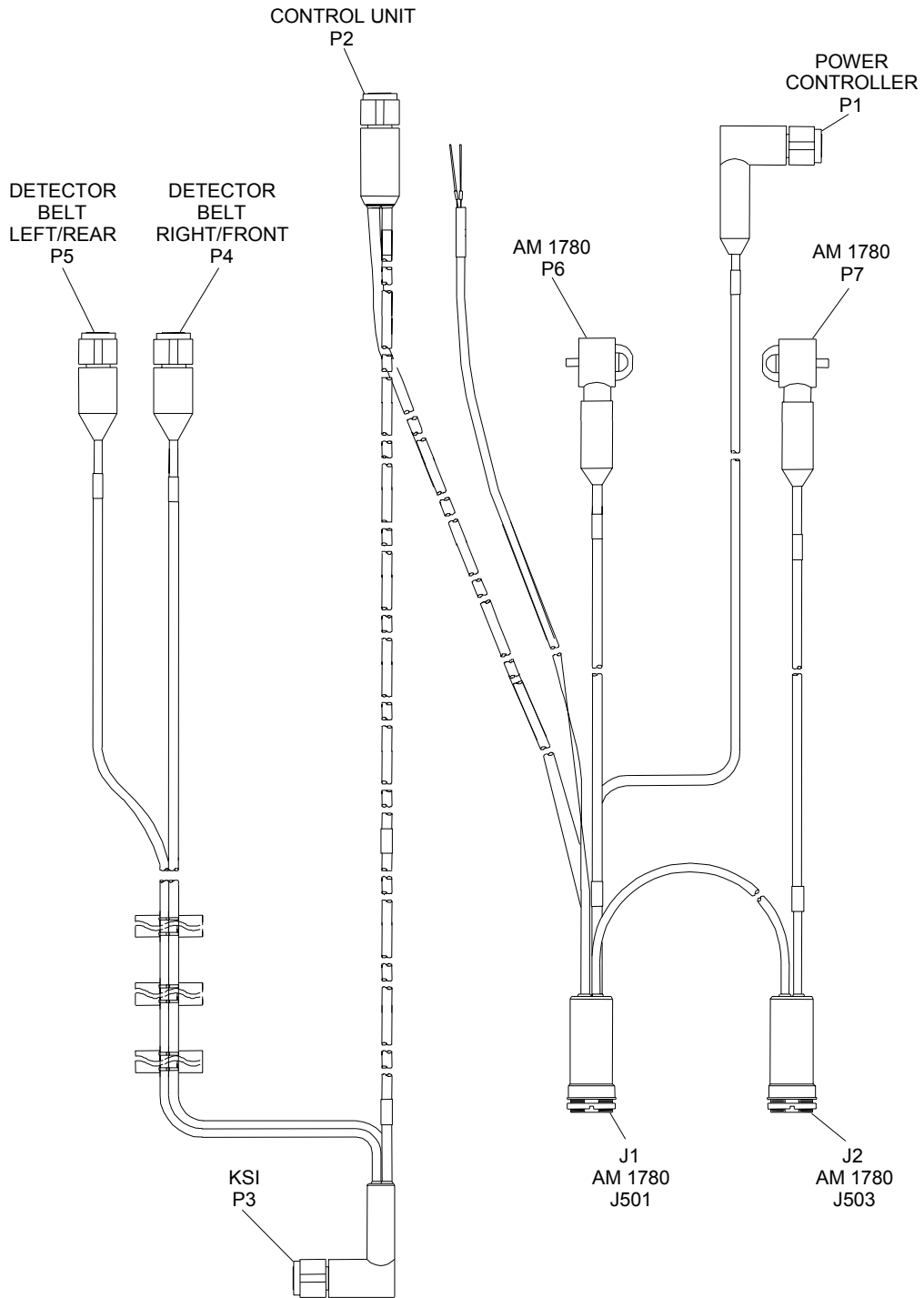
Secure all cables out of the way with fastener tape tie-wraps.

NOTE

Connectors P6 and P7 must be connected to the AM 1780 even if only one radio is being used.

2.3.2.9.2 M113 (M577) VIS ONLY System Cable. (See Figure 2-22.)

- a. Route segment (J1) and segment (P6) to Master Control Station (MCS) Radio A, and connect (P6) to (J1) connector on Radio A. Connect (J1) to the removed cable connector. (See Figures 2-23 and 224.)
- b. Route segment (J2) and segment (P7) to MCS Radio B, and connect (P7) to (J2) connector on Radio B. Connect (J2) to the removed cable connector.
- c. There will be two insulated wires, stripped at the ends and tinned, attached to the System Cable near the segments connected to the amplifier. Connect the tinned part of the (-) wire to the (-) lines binding post on the MCS. Connect the tinned part of the (+) wire to the other (+) lines binding post on the MCS.
- d. Route segment (J3) and segment (P8) to MCS Radio Power, and connect (P8) to (J5) of the MCS power supply. Connect (J3) to the removed cable connector.
- e. Route segment (P2-red sleeve) to the CU, and connect (P2) to (J1) of the CU. (See Figure 2-20.)
- f. Route segment (P1-violet sleeve) to the Power Controller, and connect (P1) to (J1) of the Power Controller. (See Figure 2-21.)
- g. Secure all cables out of the way with fastener tape tie-wraps.



32100001-DT

Figure 2-17. M113 VIC System Cable.

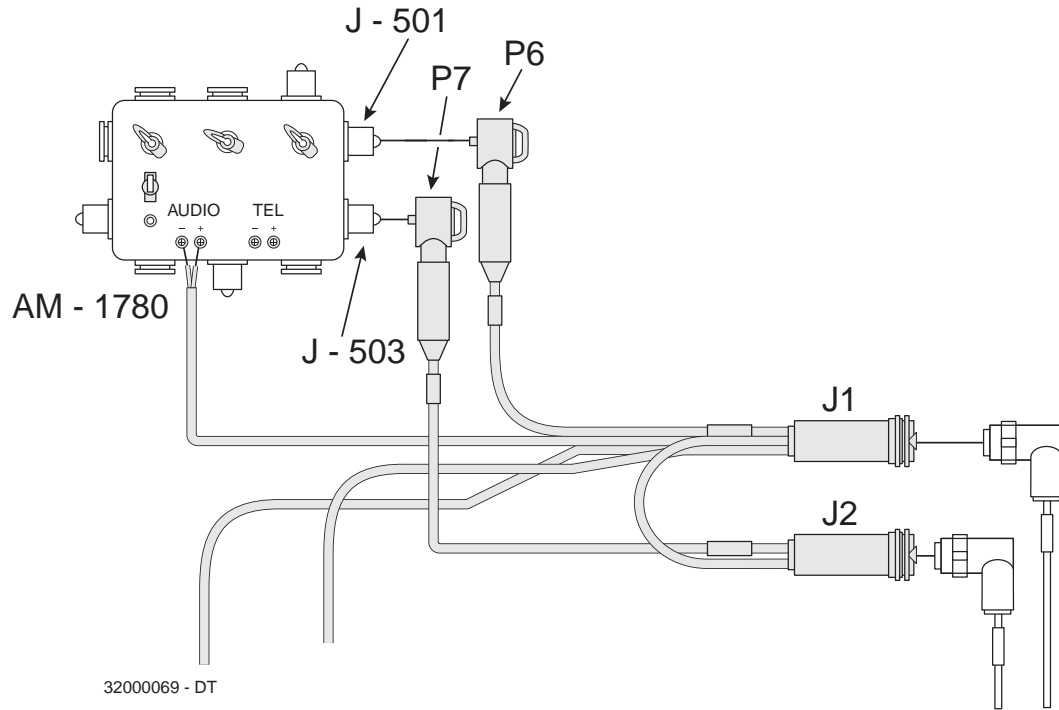


Figure 2-18. Cable Routing to AM-1780 Amplifier.

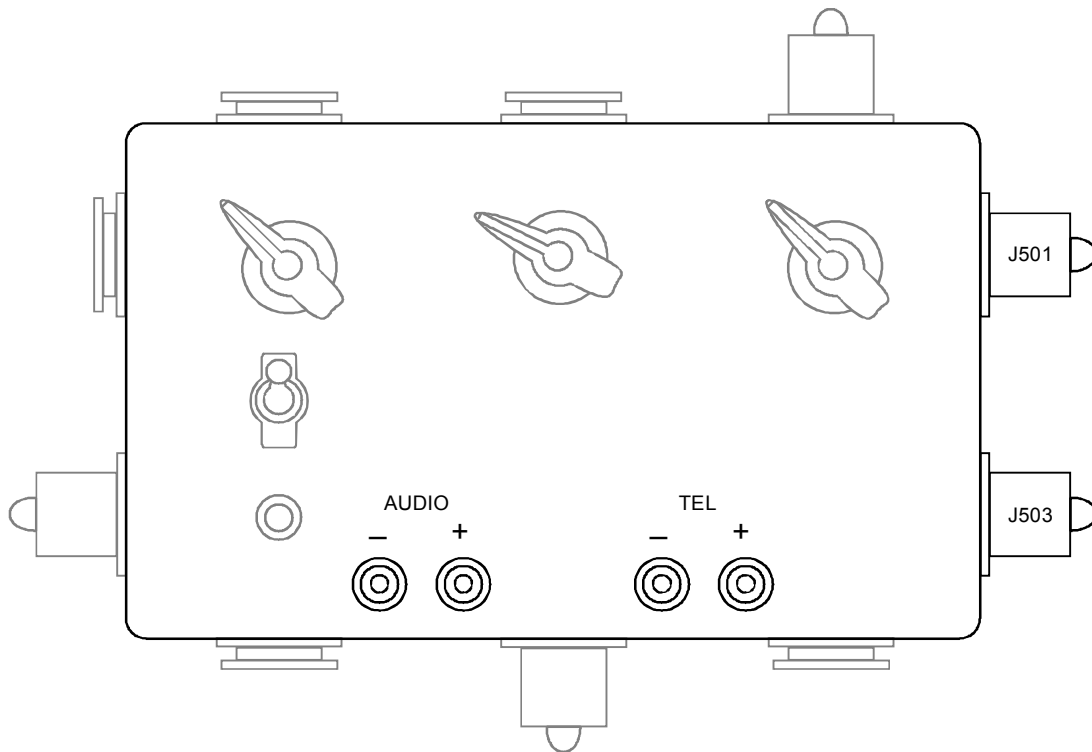


Figure 2-19. AM-1780.

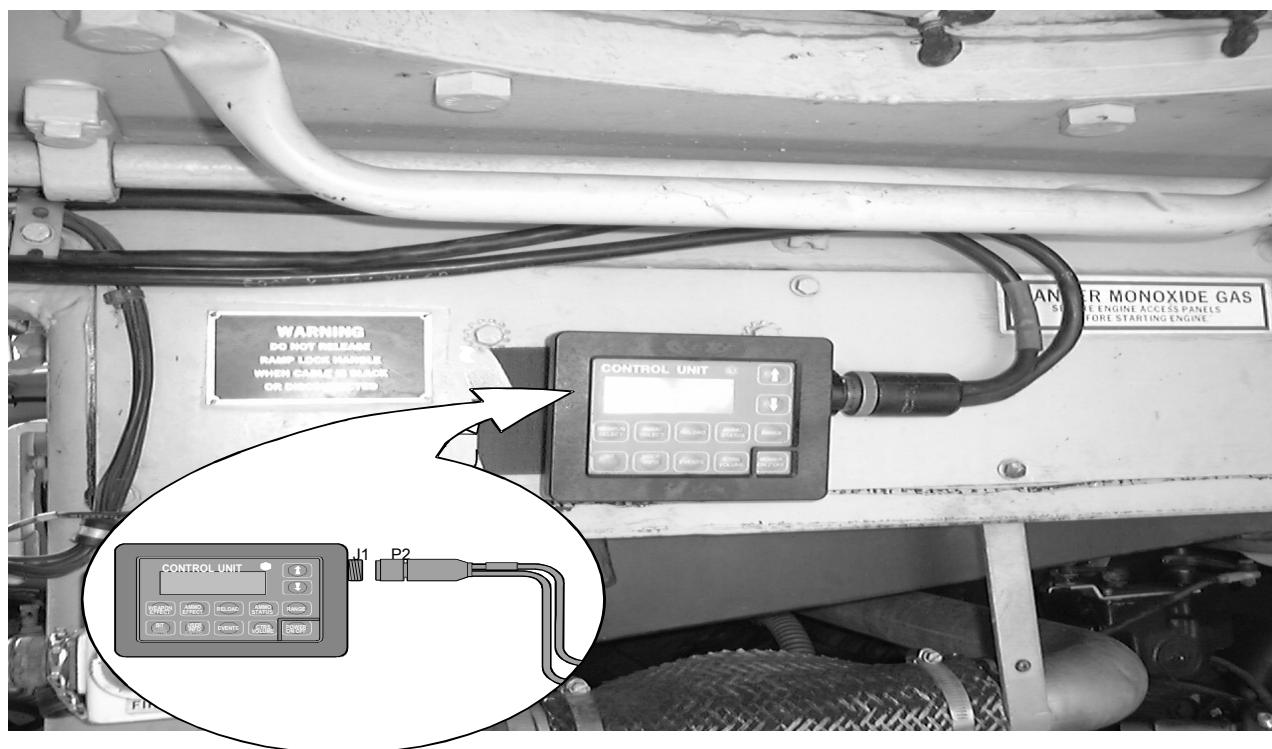


Figure 2-20. M113 Control Unit Connection to System Cable.

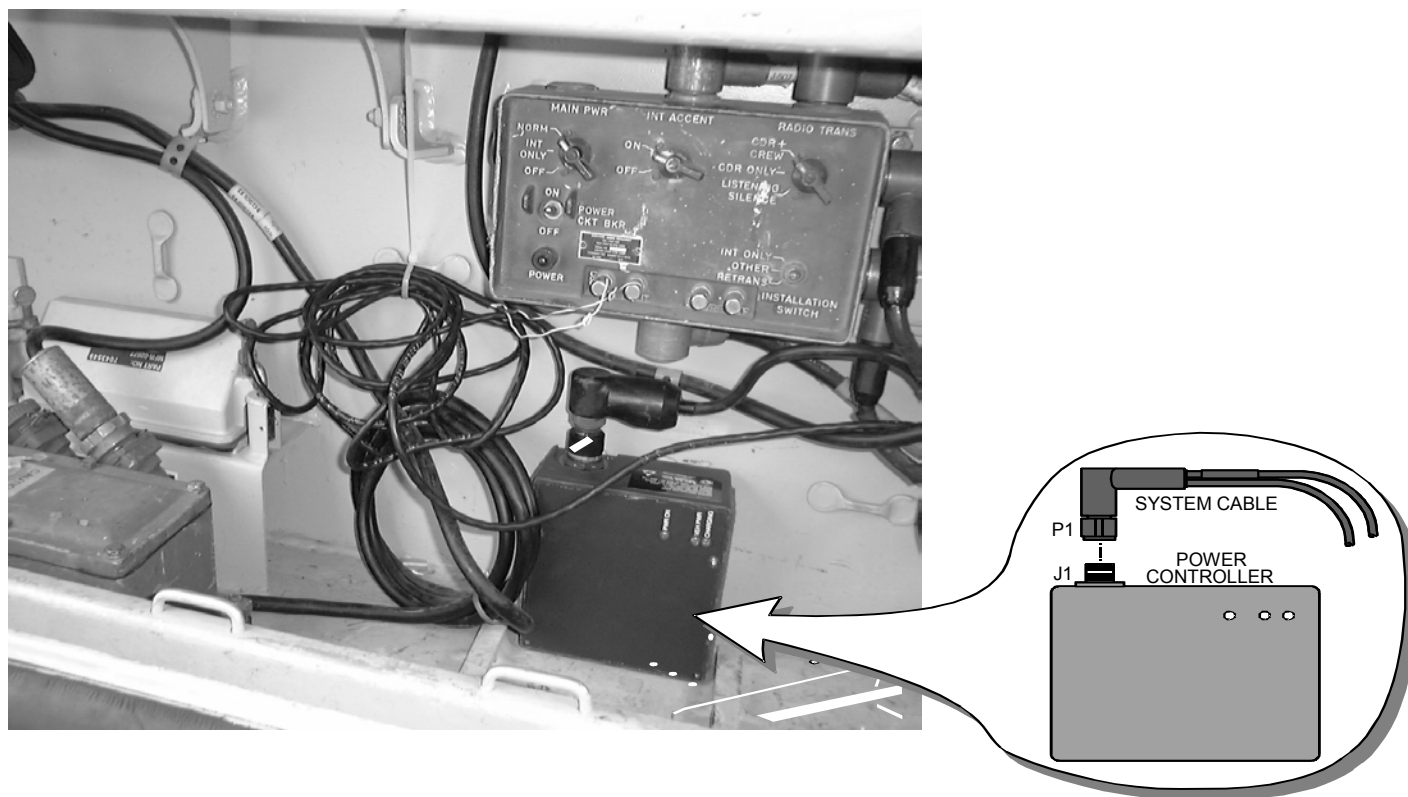


Figure 2-21. M113 System Cable Connection to Power Controller.

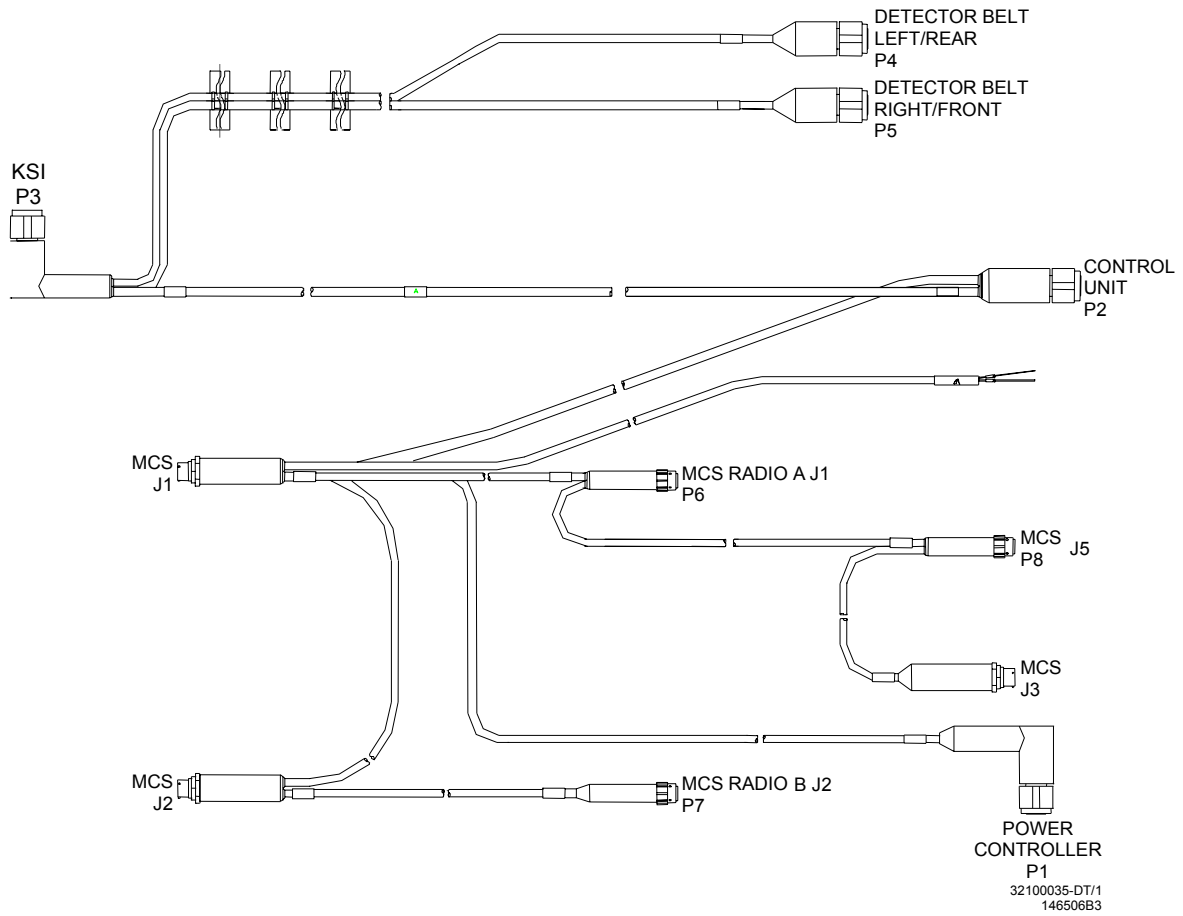
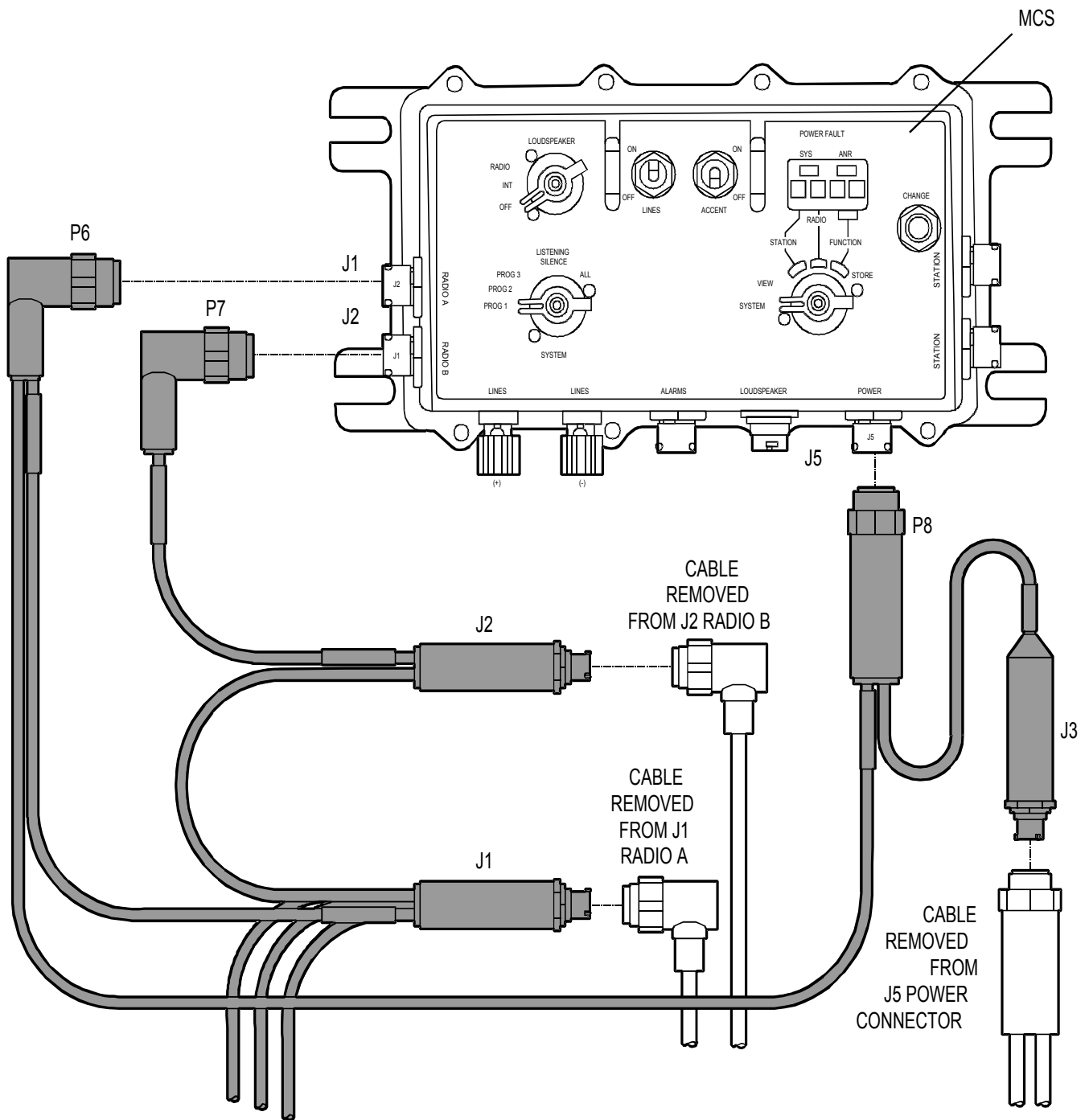
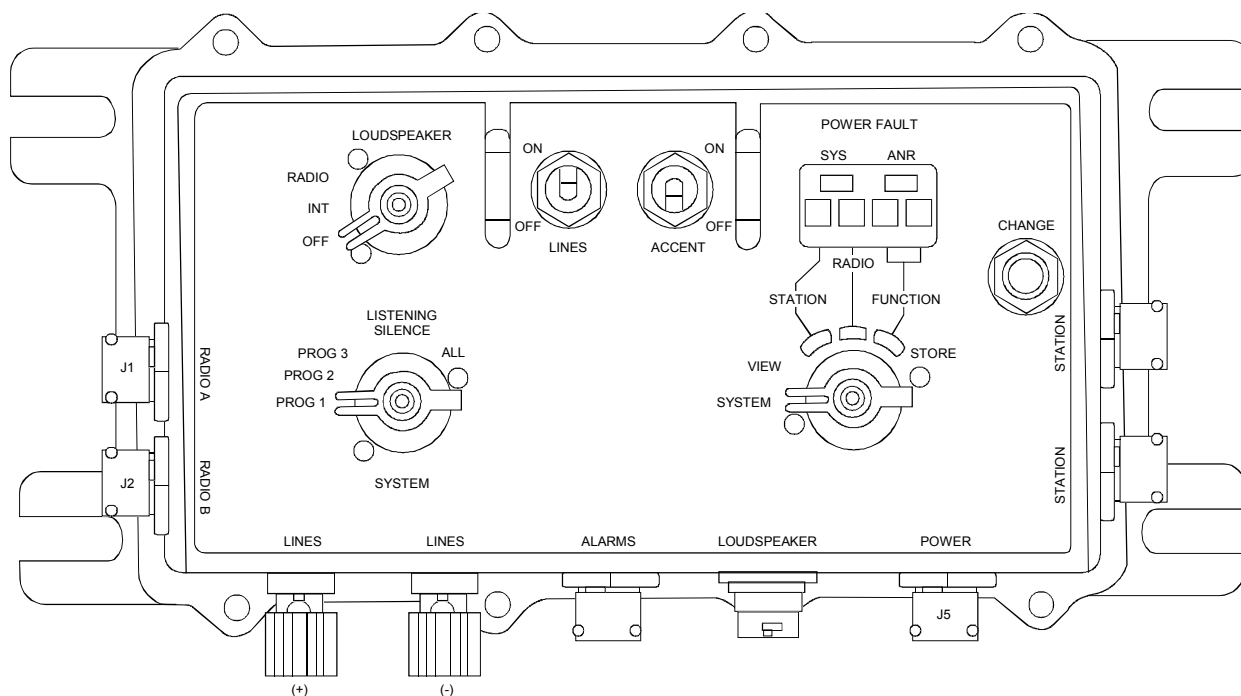


Figure 2-22. M113 VIS System Cable.



32000157-DT/2

Figure 2-23. M113 VIS System Cable Connection to MCS.



31100287-DT

Figure 2-24. Master Control Station (MCS).

2.4 INITIAL ADJUSTMENTS, BEFORE USE, DAILY CHECKS, AND SELF-TEST REQUIREMENTS.

Before operating MILES 2000 equipment, perform the following:

- Ensure preventive maintenance checks and services (PMCS) described in Section II have been performed.
- If there is a DIFCUE installed on the vehicle (M577 only), load the DIFCUE FU and arm the DIFCUE. (Refer to TD 9-6920-893-10.)
- Perform the functional checks described in Section V.

2.5 OPERATING PROCEDURES.

WARNING

Verify MGSS (M1A1/M1A2 only) or DIFCUE Firing Unit (if installed) is in the SAFE position before powering up the MILES 2000 System. Serious personal injury/death could occur.

NOTE

The M2 SAT must be enabled by the commander's IWS. Refer to IWS Operator's Manual TD 23-7920-702-10. Fire the M2 machine gun using normal procedures.

NOTE

Ensure that the Power Controller is fully charged. A Power Controller near discharge will cause either BIT to continuously cycle when the system is powered up, or cause the system to continuously reset. Should this occur, turn the Control Unit (CU) off, start the vehicle and allow the Power Controller to recharge for 15 minutes, or replace the Power Controller.

2.5.1 Control Mode On Operating Procedures.

Upon power up, the Control Unit (CU) will come up with a vehicle status of “CHEAT KILL,” and the KSI will flash continuously. The controller can reset the vehicle status by setting the CD/TDTD for “reset” and firing at a detector on the vehicle. The KSI will flash once and then stop flashing, and the vehicle intercom will sound with “reset.” The vehicle may be made mission ready in one of two ways: 1) the controller can set up information for the vehicle and weapons type on the MARS computer and upload the information to the CD/TDTD, then upload the information to the vehicle via the optical port on the KSI; or 2) the controller can set the vehicle status to “Control Mode On,” and the required information can be set from the CU.

Control Mode-On gives the user the ability to configure ones vehicle to any configuration they desire for training purposes. For example, a Bradley Fighting Vehicle could be configured as a BMP II for OPFOR training purposes. To perform the Control Mode-On procedures, do the following:

- a. Turn the Control Unit (CU) on. MILES 2000 equipment should power up and automatically run BIT. Upon completion, the vehicle intercom sounds with “Audio Check,” and indicates whether BIT passed or failed.

NOTE

“Switch Test” will be displayed on the CU during BIT. Verify push buttons are working correctly.

- b. After the power on BIT completes, the system will be in a “killed” state and will display “CHEAT KILL POWER SOURCE TAMPER” for approximately 7 seconds. The KSI will continuously flash. Using the CD/TDTD, reset the system.
- c. Set the CD/TDTD to Clear Events, and place the CD/TDTD into the Kill Status Indicator (KSI) Optical Port and pull the trigger.
- d. Press the EVENTS push button on the CU events to verify that it has been cleared.
- e. Change the vehicle status to “Control Mode On” by setting the CD/TDTD accordingly. Aim at a detector and pull the trigger.
- f. The KSI will flash once, the CU should display as indicated below, and the vehicle intercom will sound with “CONTROL MODE ON”:

CONTROL MODE ON (LIMIT 5 MINUTES)

NOTE

Pressing any push buttons other than the following four will shut Control Mode off: Up arrow, Down arrow, CTRL/FCTN (red label), and the User Info/Enter (red label) push buttons.

- g. With a vehicle status of “Control Mode On,” perform the following actions:
 - (1) Press the **USER INFO/ENTER** push button on the CU.
 - (2) The CU will display the main menu:

HOST PLATFORM

VEHICLE SIMULATED

WESS SELECTIONS (This applies only to vehicles with Turret weapons, not SATs)

- (3) Cursor will be flashing next to “HOST PLATFORM”, press **ENTER**. The CU will display a list of vehicles that may be selected from.
- (4) Move the cursor to “VEHICLE” and press **ENTER**. The CU will return to the previous screen.

HOST PLATFORM
VEHICLE SIMULATED

- (5) The cursor has now moved to “VEHICLE SIMULATED”. Press **ENTER**.
- (6) The CU will now display:

DEFAULT VEHICLE
CUSTOM VEHICLE

- (7) The cursor is on “DEFAULT VEHICLE”. Press **ENTER**. The CU will display a list of vehicles.
- (8) Move cursor to M113 and press **ENTER**. The CU will display the Threshold screen.
- (9) The CU will display a default threshold of 125 for the M113 family series. Press **ENTER**.

NOTE

We never change the Threshold.

- (10) This returns you to the main menu.
 - (11) Press any other key to exit.
- h. Time Sync the system by using the CD/TDTD. Set your CD/TDTD up and aim at the detectors and pull the trigger.

NOTE

CD/TDTD must be set up on Time Sync from another CD/TDTD first.

- i. To Down load and/or clear the Events on the vehicle, set the CD/TDTD to “Clear Events”, connect the CD/TDTD to the KSI Optical Port and pull the trigger.

NOTE

Time Sync and down loading or clearing events work the same on the Individual Weapons System and the CU on the vehicles.

2.5.2 Console Display at Night or Limited Visibility.

- a. Press either of the Arrow push buttons on the CU or IWS Console (DPCU). This will light the display for 3 seconds.
- b. Make your selection. Once a push button is pressed, the display will stay lighted for 7.5 seconds, (or for 7.5 seconds after the last push button has been pressed).

- c. After the last push button is pressed and 7.5 seconds has elapsed, the display will return to the default screen. The display will then stay lighted for another 3 seconds.
- d. When BIT is run [from power on (battery replacement) or initiated by the user], the display will stay lit during BIT.

SECTION IV. OPERATION UNDER UNUSUAL CONDITIONS

2.6 ASSEMBLY AND PREPARATION FOR USE UNDER UNUSUAL CONDITIONS.

2.6.1 Unusual Environment/Weather. MILES 2000 equipment is ruggedized to withstand extreme changes in temperature, terrain, and environment. Therefore, assembly and preparation in unusual environment/weather should only require the caution necessary to ensure the safety of the operators and other participants.

2.6.2 Fording and Swimming. MILES 2000 equipment is waterproof and ruggedized. Therefore, equipment transport which requires fording and/or swimming should only require caution necessary to safeguard operators and participants, and to maintain control and accountability of the equipment.

2.6.3 Emergency Procedures. MILES 2000 equipment requires no additional procedures for emergency situations, as the equipment has been developed to be used for training simulations encompassing a great variety of conditions and levels of threat.

SECTION V. FUNCTIONAL CHECKS

2.7 FUNCTIONAL CHECKS.

The functional check for MILES 2000 M113 equipment is accomplished by the Built-In-Test (BIT) performed by the Control Unit (CU). It will run the BIT, and the CU display screen will stay lighted during the test. Once the test has been run, the CU will display the results on the screen. Table 3-1 in Chapter 3, Section I, Troubleshooting, contains the list of possible error messages the CU may display with the MILES 2000 equipment.

2.7.1 Built-In-Test (BIT). To run the vehicle system BIT, perform the steps in Table 2-4. To run the Individual Weapons System (IWS) BIT, perform the steps in Table 2-5.

Table 2-3. M113 Built-In-Test.

ACTION	INDICATION
<p>Turn Control Unit (CU) ON.</p> <p>“SWITCH TEST” will be displayed on the CU.</p> <p>Press the “WEAPON SELECT” push button on the CU.</p> <p>Press the “AMMO SELECT” push button.</p> <p>Continue to do the switch test until you are satisfied that the push buttons are working properly.</p> <p>To continue the BIT, simply stop pressing push buttons.</p> <p>Read results of BIT.</p> <p>Reset vehicle with the CD/TDTD.</p>	<p>CU display should light and stay lighted throughout the test.</p> <p>MILES 2000 equipment should power up.</p> <p>Vehicle intercom sounds with “Audio Check,” then indicates BIT pass or failure. The KSI will flash continuously.</p> <p>CU will automatically begin the BIT.</p> <p>User may now test push buttons on CU to ensure the push buttons are working properly.</p> <p>The display should read “WEAPON SELECT.”</p> <p>The display should read “AMMO SELECT.”</p> <p>The display should match the label of the push button being pressed. Arrow push buttons should read “UP” or “DOWN.”</p> <p>The unit will automatically continue the BIT without further command.</p> <p>The display will indicate one of the following:</p> <p>“CHEAT KILL POWER SOURCE TAMPER.”</p> <p>The display will indicate one of the following:</p> <p>BIT PASSED - Indicates an operational system. then</p> <p>READY - The equipment has passed the BIT and the mission may be continued.</p> <p>or</p> <p>BIT FAIL (with error message) - All or part of the equipment has failed the BIT or the equipment is not present or is not properly connected. Refer to Chapter 3, Section I, Table 3-1 for further action.</p> <p>KILLED - The equipment has suffered a Catastrophic Kill. Contact the Controller.</p>

Table 2-4. IWS Built-In-Test (BIT).

ACTION	INDICATION
For PN 147421, insert battery in Individual Weapons System (IWS) Console (DPCU). This will automatically power up the console.	IWS Console (DPCU) will automatically run the BIT. IWS Console (DPCU) display should light and stay lighted throughout the BIT.
For PN 148245, move (gently shake) the IWS Console (DPCU). This will activate the internal mercury switch and automatically power up the IWS Console (DPCU).	IWS Console (DPCU) will automatically run the BIT. IWS Console (DPCU) display should light and stay lighted throughout the BIT.
“SWITCH TEST” will be displayed.	User may now test push buttons on IWS Console (DPCU) to ensure the push buttons are working properly.
Press the “WEAPON ON/OFF” push button.	The display should read “WEAPON ON/OFF.”
Press the “EVENTS” push button.	The display should read “EVENTS.”
Continue to do the switch test until you are satisfied the IWS Console (DPCU) push buttons are working properly.	The display should match the label of the push button being pressed. Arrow push buttons should read “UP” or “DOWN.”
BIT continues after switch test.	
BIT results.	“PASS” indicates IWS is operational.
	“FAIL” indicates a problem.
	Refer to Chapter 3, Section I, Table 3-1.

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CHAPTER 3 OPERATOR MAINTENANCE INSTRUCTIONS

SECTION I. TROUBLESHOOTING

3.1 TROUBLESHOOTING PROCEDURES.

Following are troubleshooting procedures for problems which may be encountered with the MILES 2000 M113 configuration. Operator troubleshooting procedures involve identifying a problem, and isolating the problem to the most likely piece(s) of equipment. Generally the BIT run by the Control Unit (CU) identifies most problems within the system, and produces an error message to let the user know that there is a problem. Table 3-1 lists the error messages that are available; the MILES 2000 equipment malfunction most likely to cause the error message; and the appropriate action to take to correct the problem. You may notice that, much of the time, the corrective action to be taken to resolve a problem is to remove the malfunctioning equipment and replace it with equipment that is working. This is because the MILES 2000 equipment is designed to need only limited maintenance at the operator and/or unit level. When the removal and replacement of equipment can be efficiently expedited, “down time” can be cut dramatically and participants can quickly return to the mission scenario, allowing them to receive maximum benefit from training. Removal and replacement procedures are located in this chapter in Section II, Operator Maintenance. See **Appendix A** for a Troubleshooting schematic.

You may encounter equipment problems not addressed in this section. If this is the case, notify the appropriate personnel (a supervisor and/or higher echelon maintenance personnel) as soon as possible.

WARNING

To prevent personal injury, turn all system power off, including the CU, before conducting any removal/replacement procedures.

Table 3-1. MILES 2000 Troubleshooting Chart for M113 Configuration .

PROBLEM	PROBABLE CAUSE(S)	ACTION
No power to MILES 2000 - No LEDs lighted on Power Controller	Connection from system cable not secure or connectors damaged.	<ol style="list-style-type: none"> 1. Check system cable connection at Power Controller. Tighten if loose. Ensure connector is not damaged, and that there is no debris or foreign objects in connector. 2. Check system cable connection to vehicle slave receptacle. Tighten if loose. Ensure connector is not damaged, and that there is no debris or foreign objects in connector. 3. Check to see whether Power is on and LED light is present on the DCU. 4. Swap out KSI and retest 5. Swap out KSI/CU and retest.
Bit Continues to cycle when system is powered up or system continuously resets.	Power Controller near discharge. Power Controller System Cable	Turn off Control Unit. Start the vehicle and allow Power Controller to recharge for 20 minutes. or Replace the power. Check Power Controller. If no LEDs lighted, remove and replace Power Controller. If problem still exists, remove and replace system cable. If problem still exists, refer problem to higher echelon maintenance.
BATTERY POWER LOW LED lighted on Power Controller.	Batteries not fully charged	Remove and replace Power Controller.
BIT FAILURES	PROBABLE CAUSE(S)	ACTION
Control Unit (CU) Memory	CU	Remove and replace.
CU	CU	Remove and replace.
CU Voice	CU	Remove and replace.
CU Display	CU	Remove and replace.

Table 3-1. MILES 2000 Troubleshooting Chart for M113 Configuration - Continued.

PROBLEM	PROBABLE CAUSE(S)	ACTION
NV RAM	CU	Ask controller to check settings for vehicle, to ensure Pk Tables are correct, and to ensure that the correct vehicle configuration is loaded. If problem still exists, remove and replace CU.
No Kill Status Indicator (KSI) Commo	KSI	Check connections; Retest. If error is repeated, remove and replace.
KSI Memory	KSI	Remove and replace.
Strobe	KSI	Check connections; Retest. If error is repeated, remove and replace.
Rear Belt	Detector Belts	Check connections; Retest. If error is repeated, remove and replace Left/Rear detector belt.
Left Belt	Detector Belts	Check connections; Retest. If error is repeated, remove and replace Rear detector belt.
Right Belt	Detector Belts	Check connections; Retest. If error is repeated, remove and replace Right/Front detector belt.
Individual Weapons System (IWS) Display	IWS Console (DPCU)	Check connections; Retest. If error repeats, remove and replace Torso Harness.
IWS Memory	IWS	Remove and replace Torso Harness.
IWS Detector/AMP	IWS	Remove and replace Torso Harness.

SECTION II. OPERATOR MAINTENANCE

3.2 OPERATOR MAINTENANCE PROCEDURES.

Much of the operator maintenance for the MILES 2000 equipment consists of removing the defective item and replacing it with functioning equipment. Remove/replace procedures for the M113 configuration are described in the following:

WARNING

To prevent personal injury, turn all system power off, including the CU, before conducting any removal/replacement procedures.

3.2.1 Remove/Replace Procedures for Individual Weapons System (IWS). Before conducting any remove/replace procedures, turn all power OFF.

3.2.1.1 CVC Helmet Harness Assembly Removal.

- a. Gently loosen the harness tape from helmet fastener tape.
- b. Remove the Helmet Harness from the helmet.
- c. Clean the Helmet Harness and prepare for turn in.
- d. Fill out the appropriate form stating the problem, and place the form in the transit case with the equipment.

3.2.1.2 CVC Helmet Harness Assembly Replacement.

- a. Adjust the harness so the three (3) patches of fastener tape inside line up with the three (3) pieces on the helmet, and the amplifier is to the rear of the helmet. Ensure there are no wrinkles or twists in the harness.
- b. Press the tape on the harness firmly against the tape on the helmet.

3.2.1.3 Torso Harness Assembly Removal.

- a. Remove the Torso Harness and disconnect from the pistol belt.
- b. Remove the battery from the IWS Console (DPCU), (PN 147421 only).

CAUTION

Ensure battery door is securely closed during storage and operations, or damage can occur to the battery door.

- c. Clean the equipment and prepare for turn in.

3.2.1.4 Torso Harness Assembly Replacement.

- a. Attach Torso Harness to pistol belt and put on the Torso Harness .
- b. Power up the IWS Console (DPCU):
 - (1) PN 147421: Install the 9-volt battery on the IWS Console (DPCU).
 - (2) PN 148245: Gently shake the IWS Console (DPCU) and press any button.

CAUTION

Ensure battery door is securely closed during storage and operations, or damage can occur to the battery door.

3.2.2 Remove/Replace Procedures for M113 (M577). Before conducting any remove/replace procedures, turn all power OFF.

3.2.2.1 M2 Small Arms Transmitter (SAT) Removal.

- a. Detach the SAT adapter clamp from the barrel of the M2 machine gun.
- b. Remove the SAT and adapter from the gun barrel, taking care not to damage the equipment.
- c. Clean the equipment and adapter, and prepare for turn in.

3.2.2.2 M2 Small Arms Transmitter (SAT) Replacement.

- a. Inspect the mounting bracket; make sure the SAT is securely mounted to the bracket.
- b. Slide the SAT and adapter over the barrel of the M2, and secure the clamp to the barrel.
- c. Torque to 85 inch-pounds.

3.2.2.3 Right/Front Detector Belt Removal.

- a. Disconnect the System Cable from the detector belt connector.
- b. Working with short sections, detach the detector belt from the fastener tape on the vehicle. Work carefully so that no electronics or wiring are damaged during removal.
- c. Clean equipment and prepare for turn in.

3.2.2.4 Right/Front Detector Belt Replacement.

- a. Working in short sections, press the detector belt against the fastener tape. Work carefully so that no electronics or wiring are damaged during replacement.
- b. Once the belt is installed, attach the System Cable connector to the belt connector.
- c. Safely secure cable using fastener tape or fastener tape tie-wraps.

3.2.2.5 Left/Rear Detector Belt Removal.

- a. Disconnect the System Cable from the detector belt connector.
- b. Working with short sections, detach the detector belt from the fastener tape on the vehicle. Work carefully so that the no electronics or wiring are damaged during removal.
- c. Clean equipment and prepare for turn in.

3.2.2.6 Left/Rear Detector Belt Replacement.

- a. Working in short sections, press the detector belt against the fastener tape. Work carefully so that no electronics or wiring are damaged during replacement.
- b. Once the belt is installed, attach the System Cable connector to the belt connector.
- c. Safely secure cable using fastener tape tie-wraps.

3.2.2.7 Kill Status Indicator (KSI) Removal.

- a. Disconnect the System Cable from the KSI connector.
- b. Disengage the rubber latches on the mounting adapter from the latching brackets on the KSI.
- c. Carefully detach the KSI from the adapter, taking care not to damage the equipment.
- d. Clean equipment and prepare for turn in.

3.2.2.8 Kill Status Indicator (KSI) Replacement.

- a. Apply fastener tape to the KSI, if needed.
- b. Place the KSI on the adapter. Ensure that the rubber latches line up with the latching brackets.
- c. Pull each rubber latch up and fasten it to its latching bracket.
- d. Connect the System Cable to the KSI connector.

3.2.2.9 Direct/Indirect Fire Cue (DIFCUE) Removal. Refer to TM 9-6920-893-10 for DIFCUE removal.

3.2.2.10 Direct/Indirect Fire Cue (DIFCUE) Replacement. Refer to TM 9-6920-893-10 for DIFCUE replacement.

3.2.2.11 Control Unit (CU) Removal.

- a. Disconnect the System Cable from the unit.
- b. Detach the CU from the vehicle, taking care not to damage the equipment.
- c. Clean the equipment and prepare for turn in.

3.2.2.12 Control Unit (CU) Replacement.

- a. Apply fastener tape to the CU, if needed.
- b. Mount the CU to the fastener tape on the vehicle.
- c. Connect the System Cable to the CU connector.

3.2.2.13 Power Controller Removal.

- a. Disconnect the System Cable from the Power Controller.
- b. Detach the Power Controller from the fastener tape on the vehicle, taking care not to damage the equipment.
- c. Clean the equipment and prepare for turn in.

3.2.2.14 Power Controller Replacement.

- a. Apply fastener tape to the bottom of the Power Controller, if needed.
- b. Attach the Power Controller to the fastener tape on the vehicle.
- c. Connect the System Cable to the power controller connector.

3.2.2.15 System Cable Removal.

- a. Disconnect cable from all units and other cables.
- b. Detach the fastener tape securing the cable to the vehicle.
- c. Remove the cable, taking care not to damage the cable or connectors.
- d. Clean the cable and prepare for turn in.

3.2.2.16 System Cable Replacement.

- a. Replace the cable using the instructions in paragraphs 2.3.2.6 and 2.3.2.9.
- b. Secure the cable to the vehicle, using the existing fastener tape.

3.3 MILES 2000 EQUIPMENT DISASSEMBLY PROCEDURES.

Perform the following procedures to remove and store the M113 equipment. Always ensure that all power to the equipment is OFF before disassembly.

- a. Disconnect System Cable, and remove it and all MILES 2000 equipment in accordance with the removal procedures in Section 3.2.
- b. Remove batteries from applicable equipment.
- c. Clean and inspect equipment. If there is any damage to the equipment, report damage on the appropriate form (a separate form for each piece of equipment), and turn-in with damaged equipment.
- d. Place equipment and System Cable(s) in the Transit Case.

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MILES 2000 TROUBLESHOOTING Vehicle System

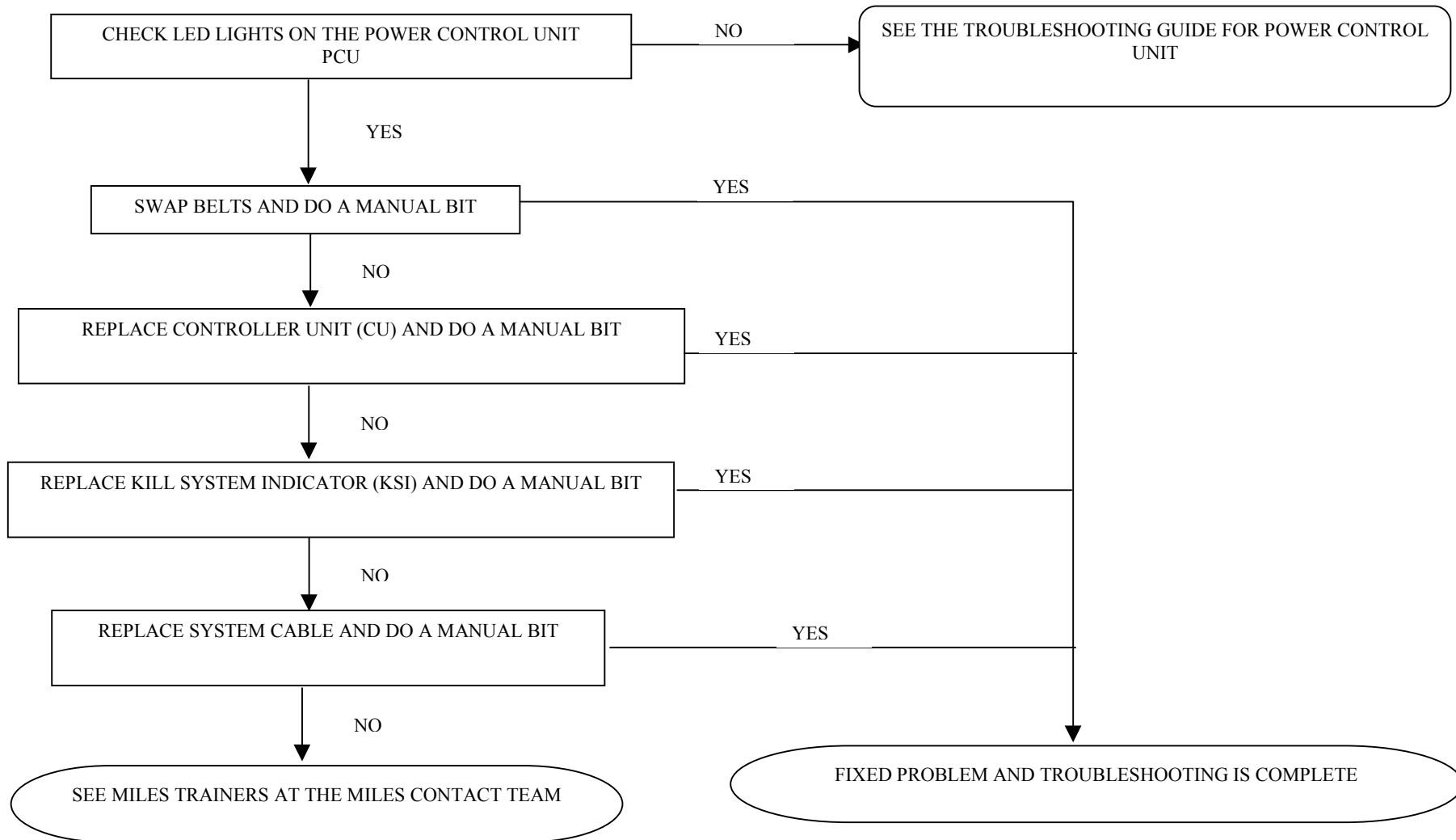
SAFETY IS ALWAYS FIRST

- ALWAYS ENSURE THAT ALL POWER IS OFF PRIOR TO INSTALLATION, UNINSTALLATION, AND DURING TROUBLESHOOTING.
- ALWAYS CHECK CABLE CONNECTION SERVICEABILITY AND TIGHTNESS.

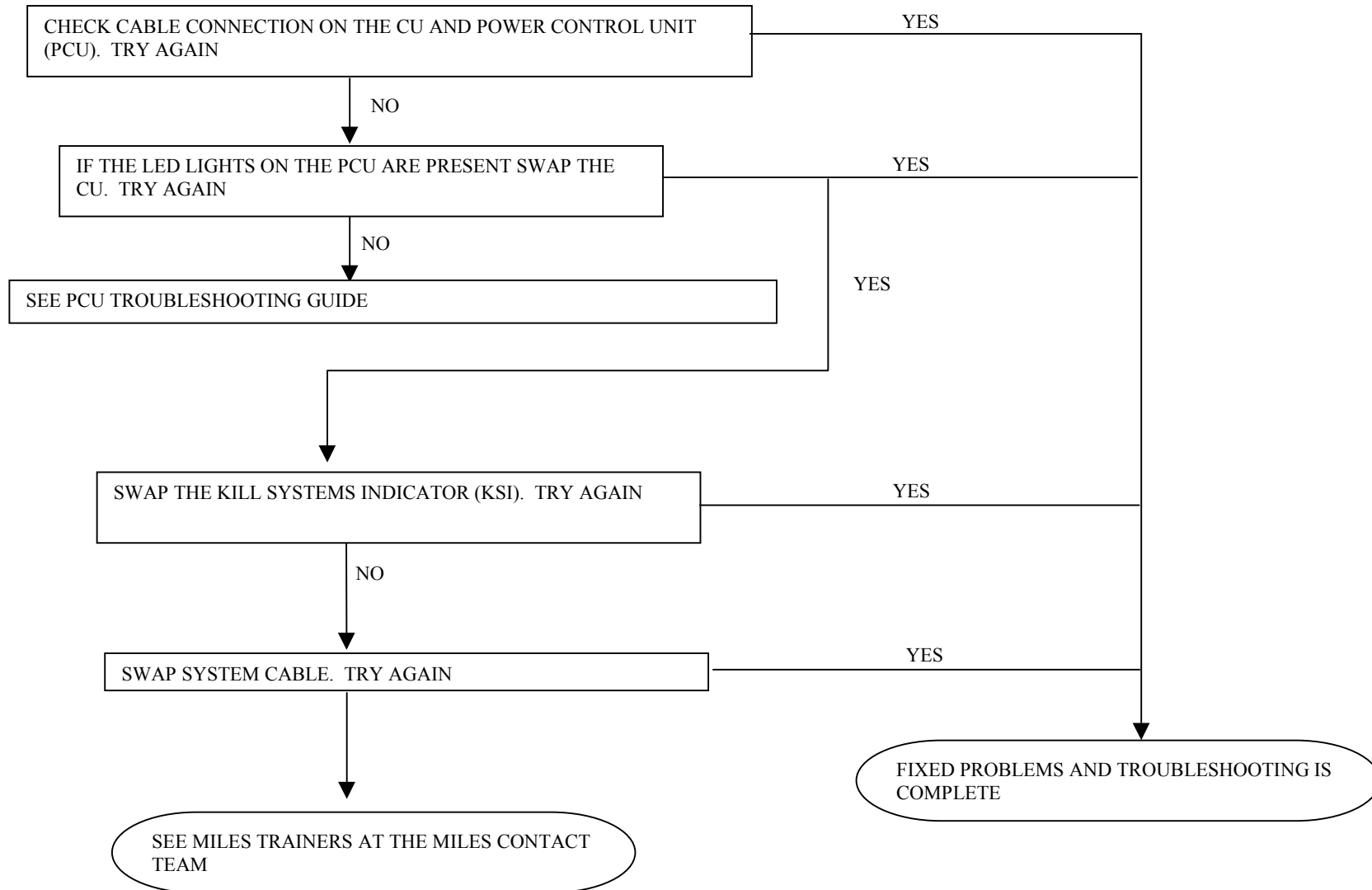
MILES 2000 TROUBLESHOOTING

Vehicle System

Belts/ Detector Array

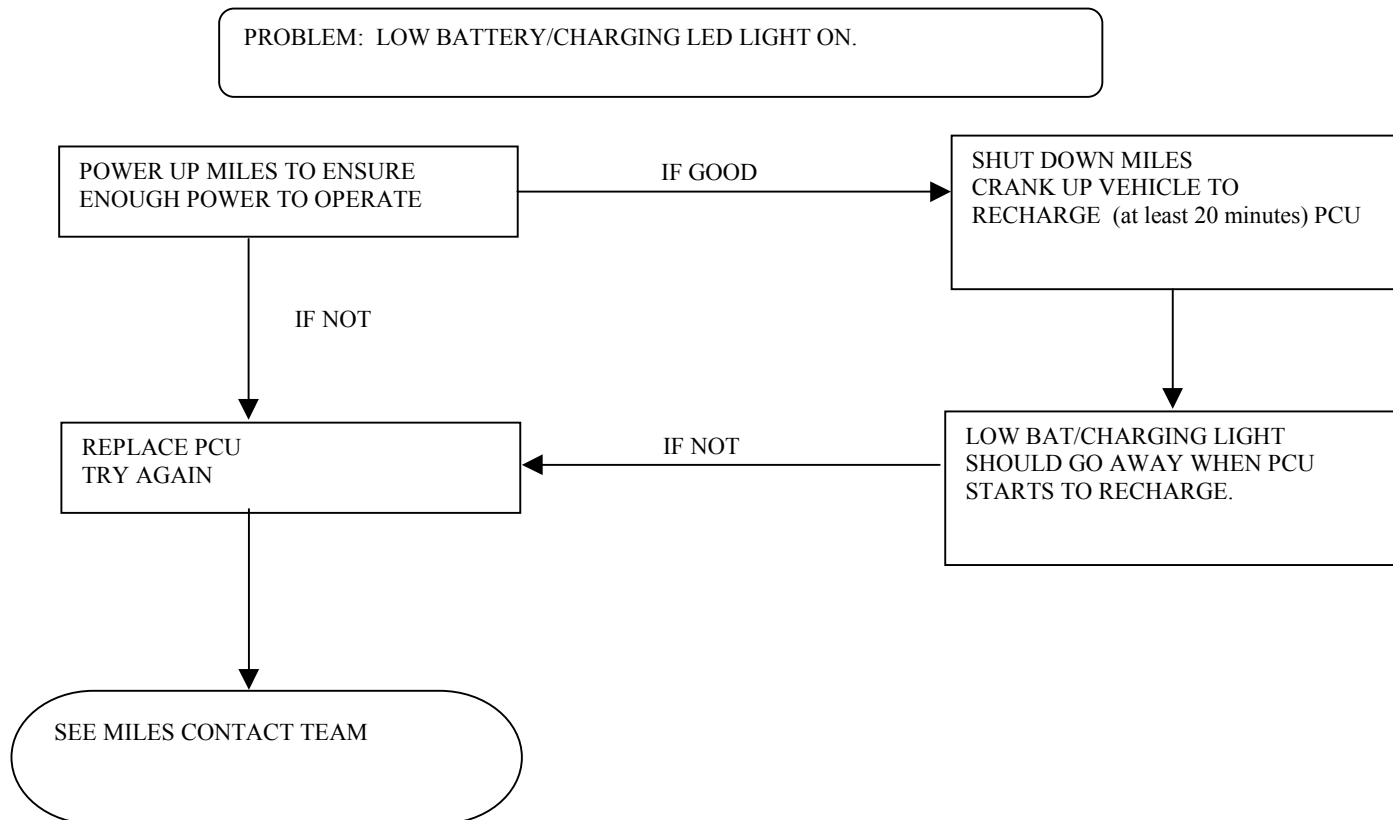


MILES 2000 TROUBLESHOOTING Vehicle System CU



MILES 2000 TROUBLESHOOTING Vehicle System

PCU



MILES 2000 TROUBLESHOOTING Vehicle System Vehicle System KSI

